OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME 44, NO. 11
MAY 23, 1955

AMERICAN DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

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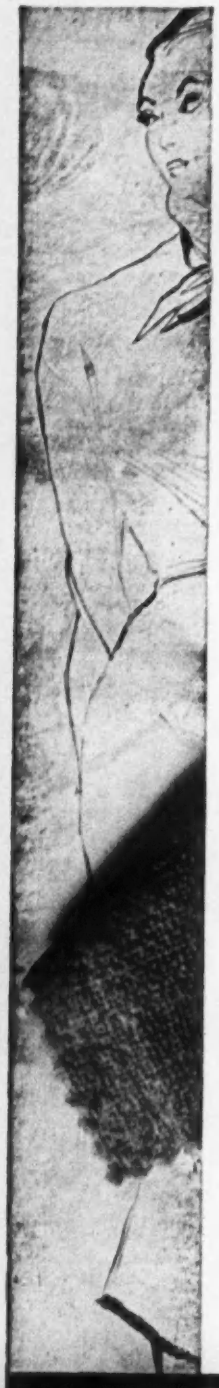

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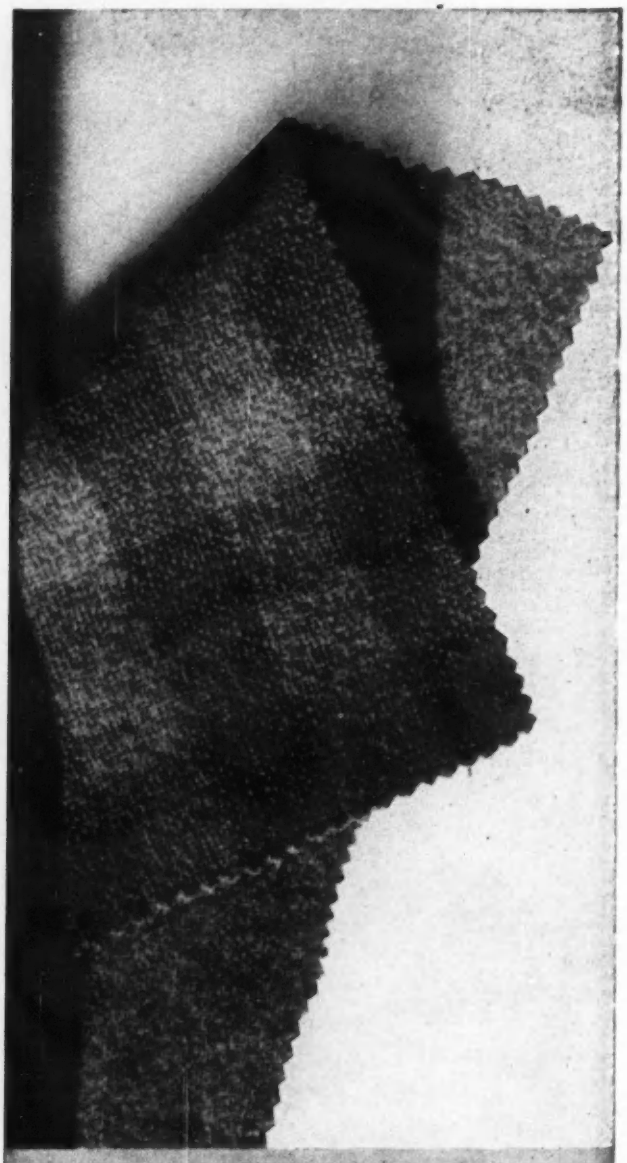

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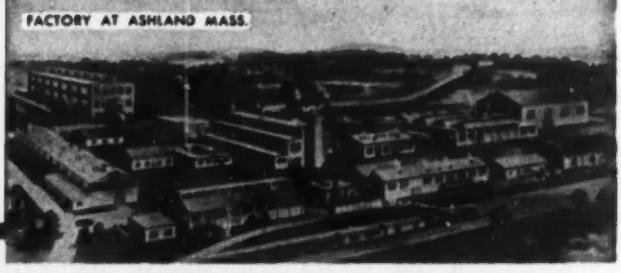

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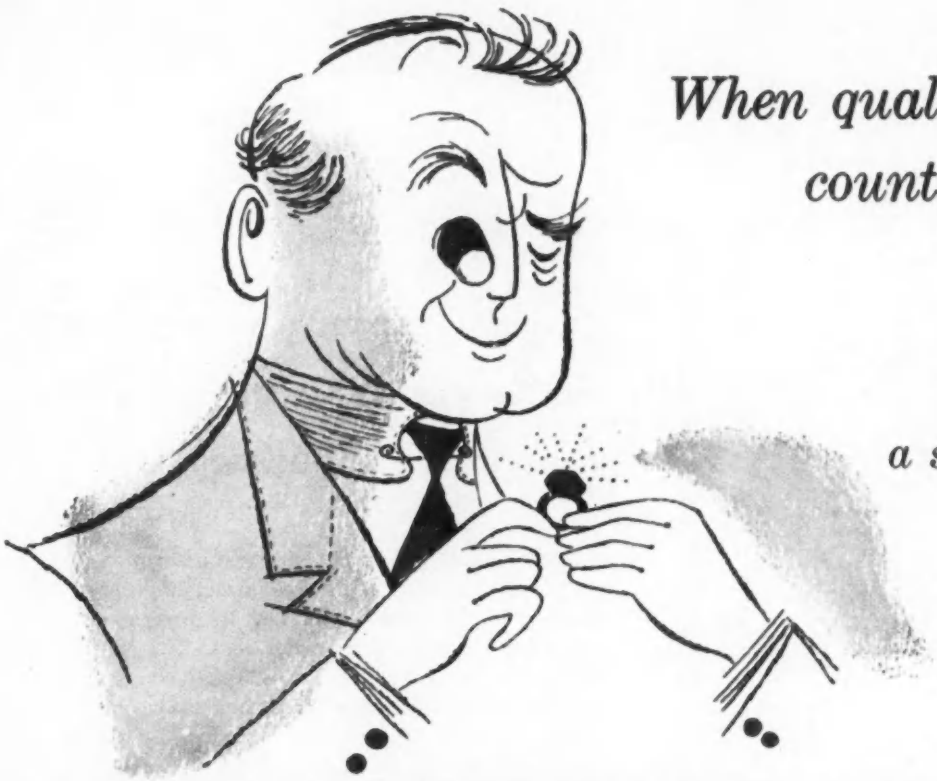

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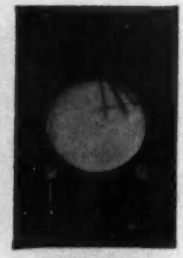

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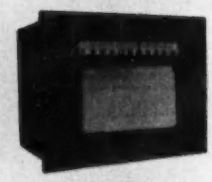

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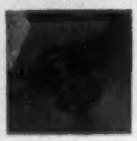

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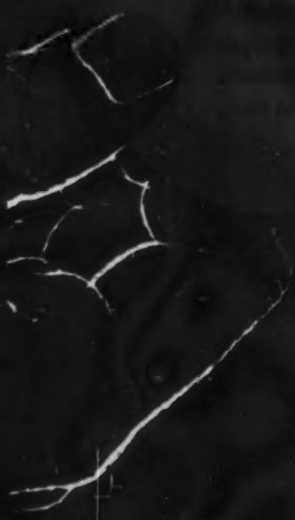

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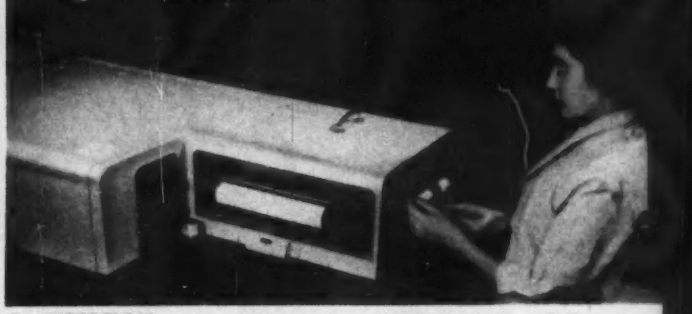
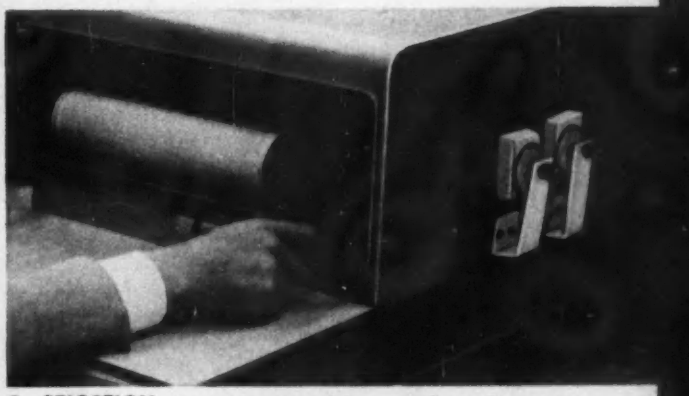


1. INSERTION of dyestuff sample and standard into G-E spectrophotometer is the first step in production-line color measurement. Samples may be either transparent or opaque.



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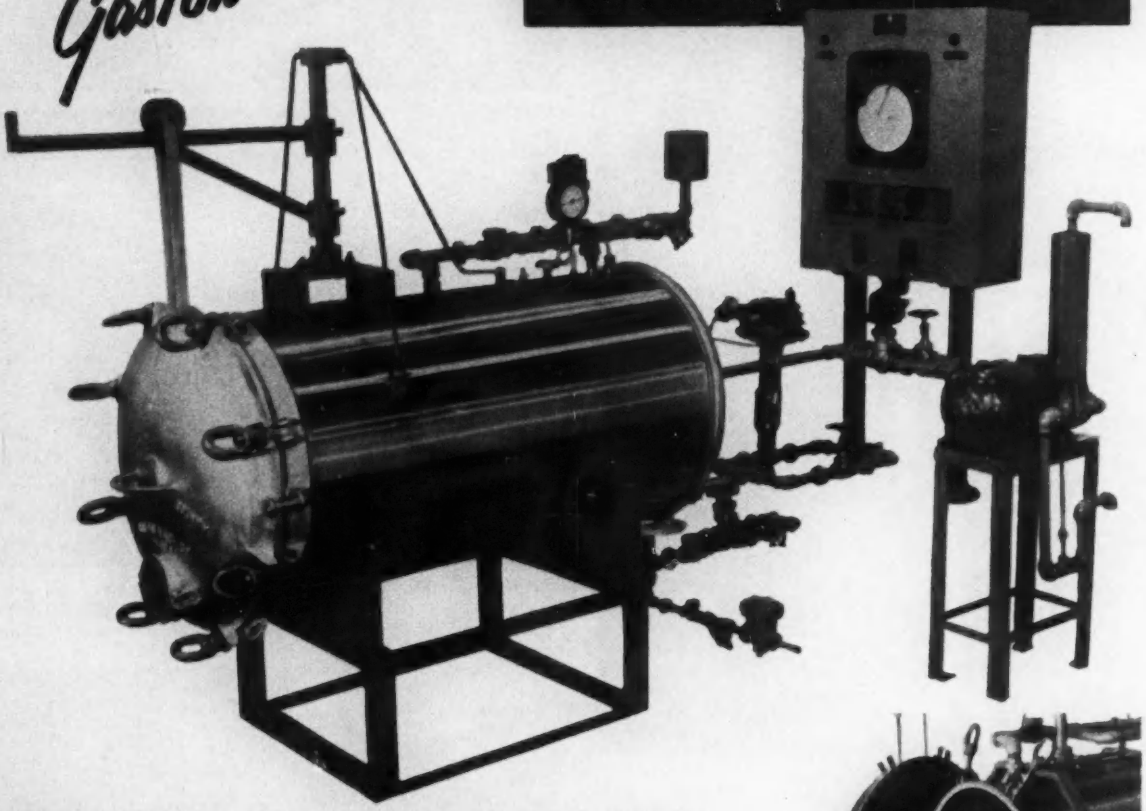

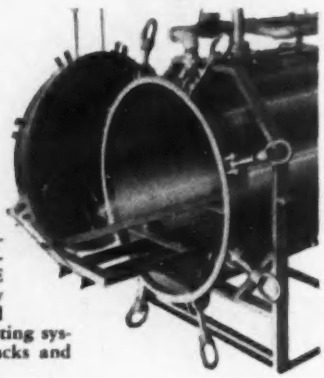

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A versatile softener on all fibers . . . outstanding on knit goods. Produces a soft and pleasing hand that's durable, *plus* antistatic properties on synthetics.

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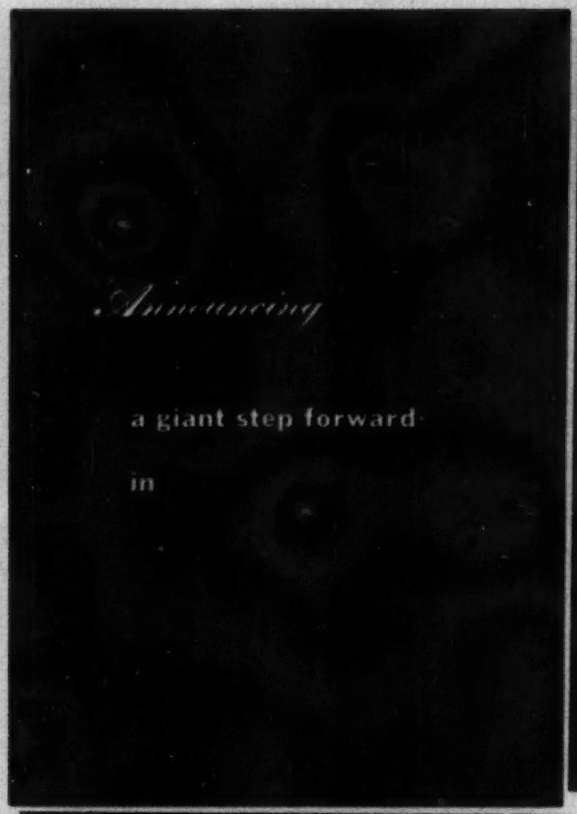

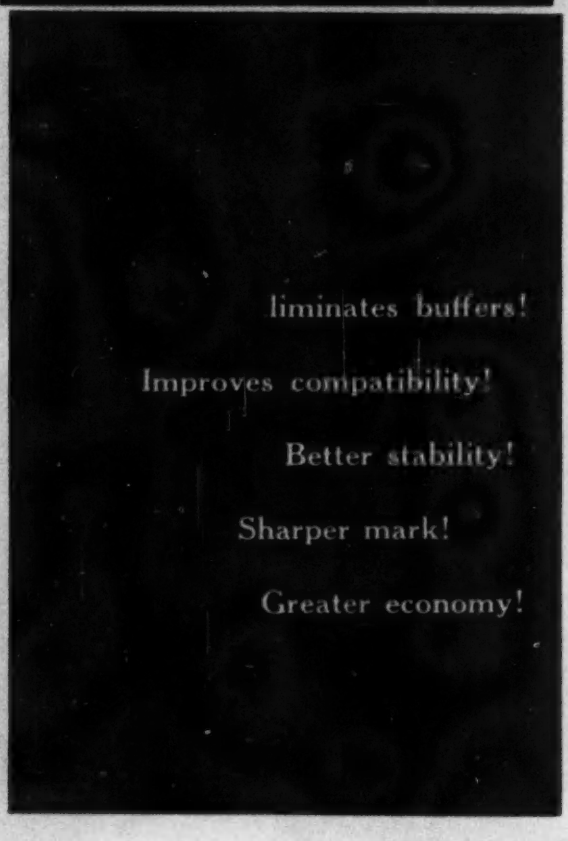

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As soon as the new plant is completed, I'll send you another snapshot. We're really proud of our progress and success that enables us to build and expand. The credit should go to you and the other mills who called on us for the answer and got the right one.

I'm looking forward to the opportunity of helping you with any other problems that you may have with your own new developments, whether in the fields of latices or resin emulsions.

Sincerely,

Bill

William Caldwell
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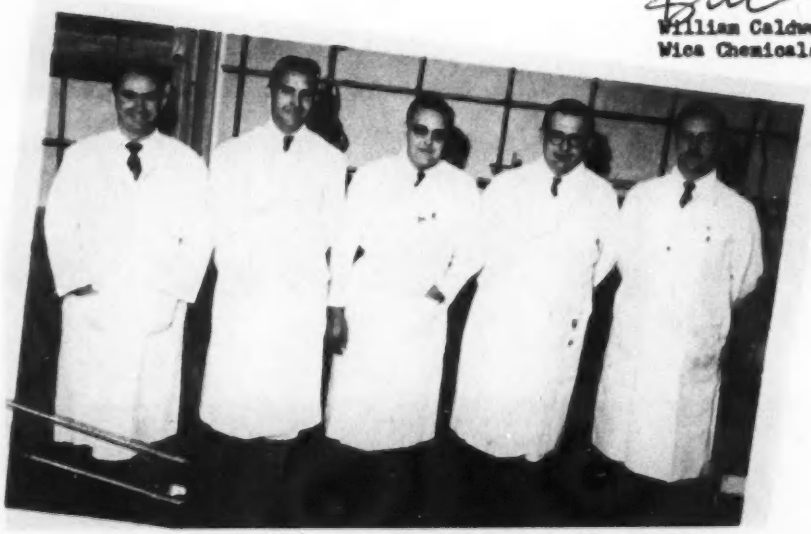

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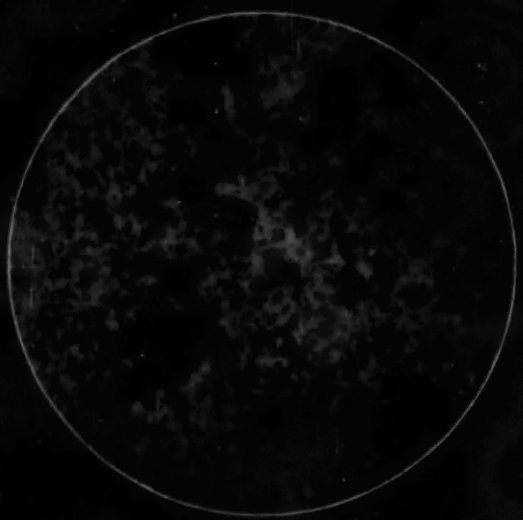

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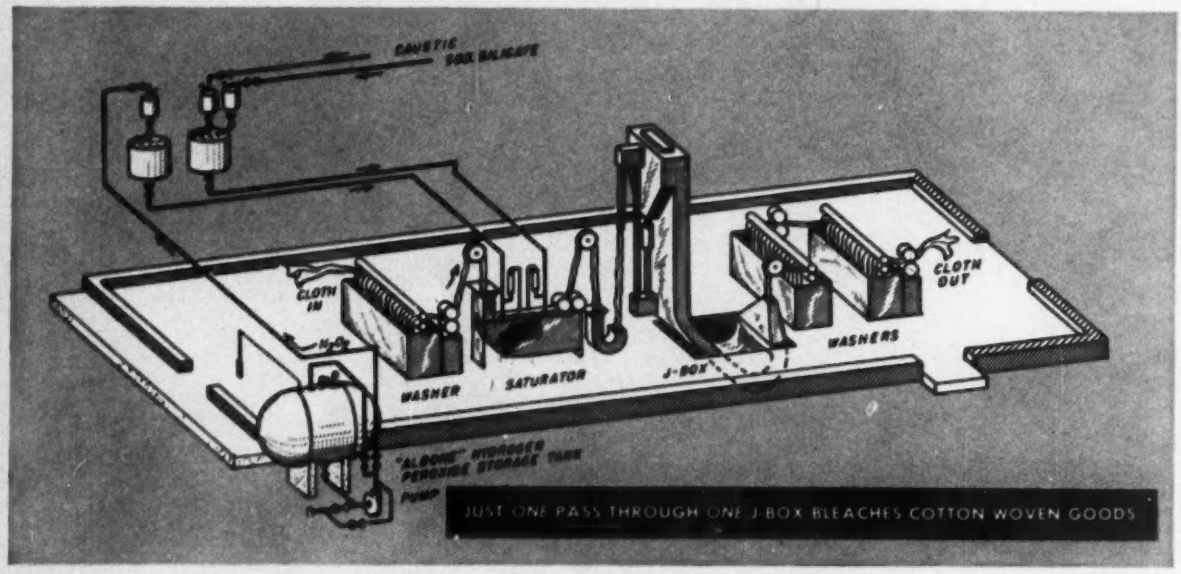

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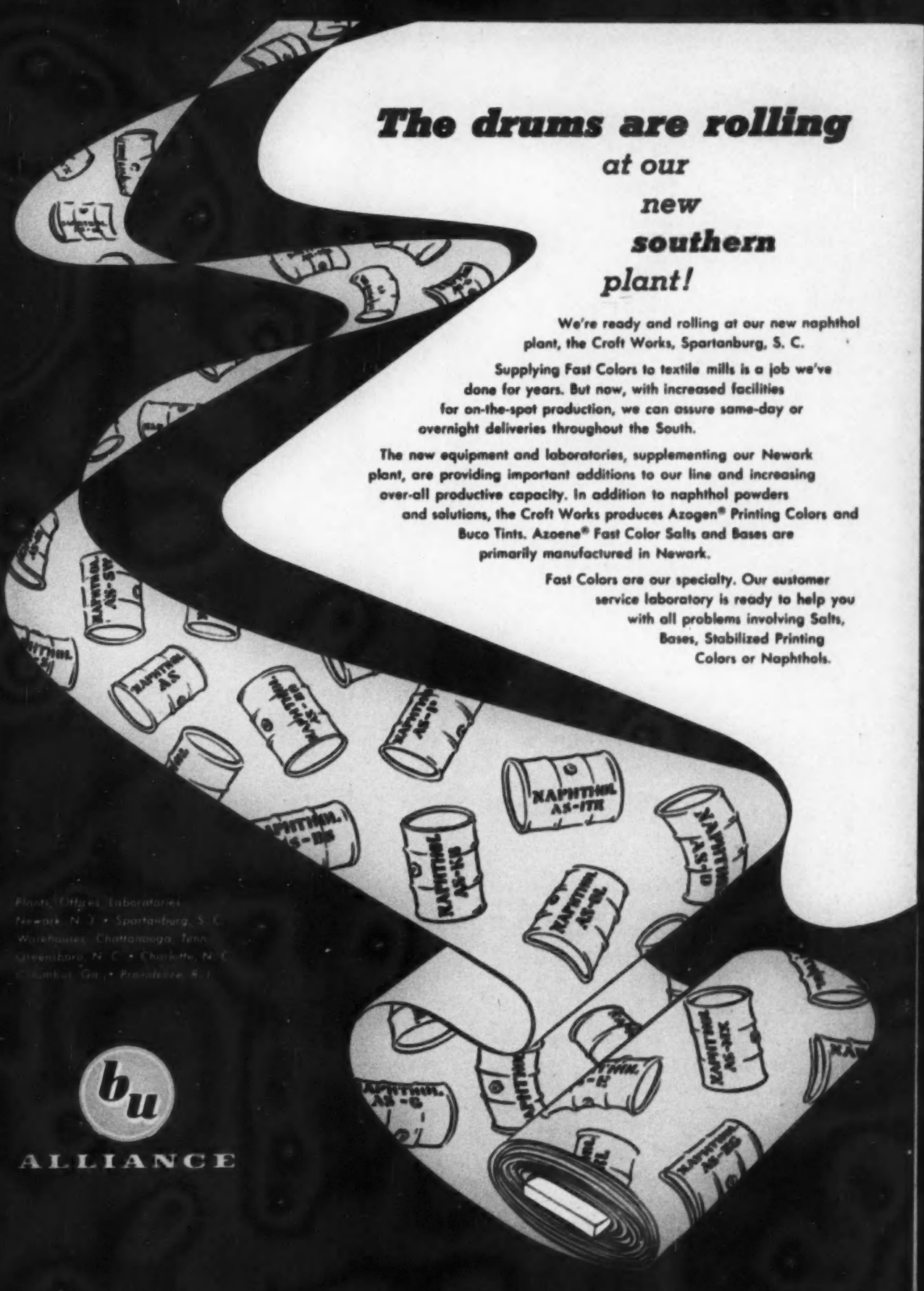

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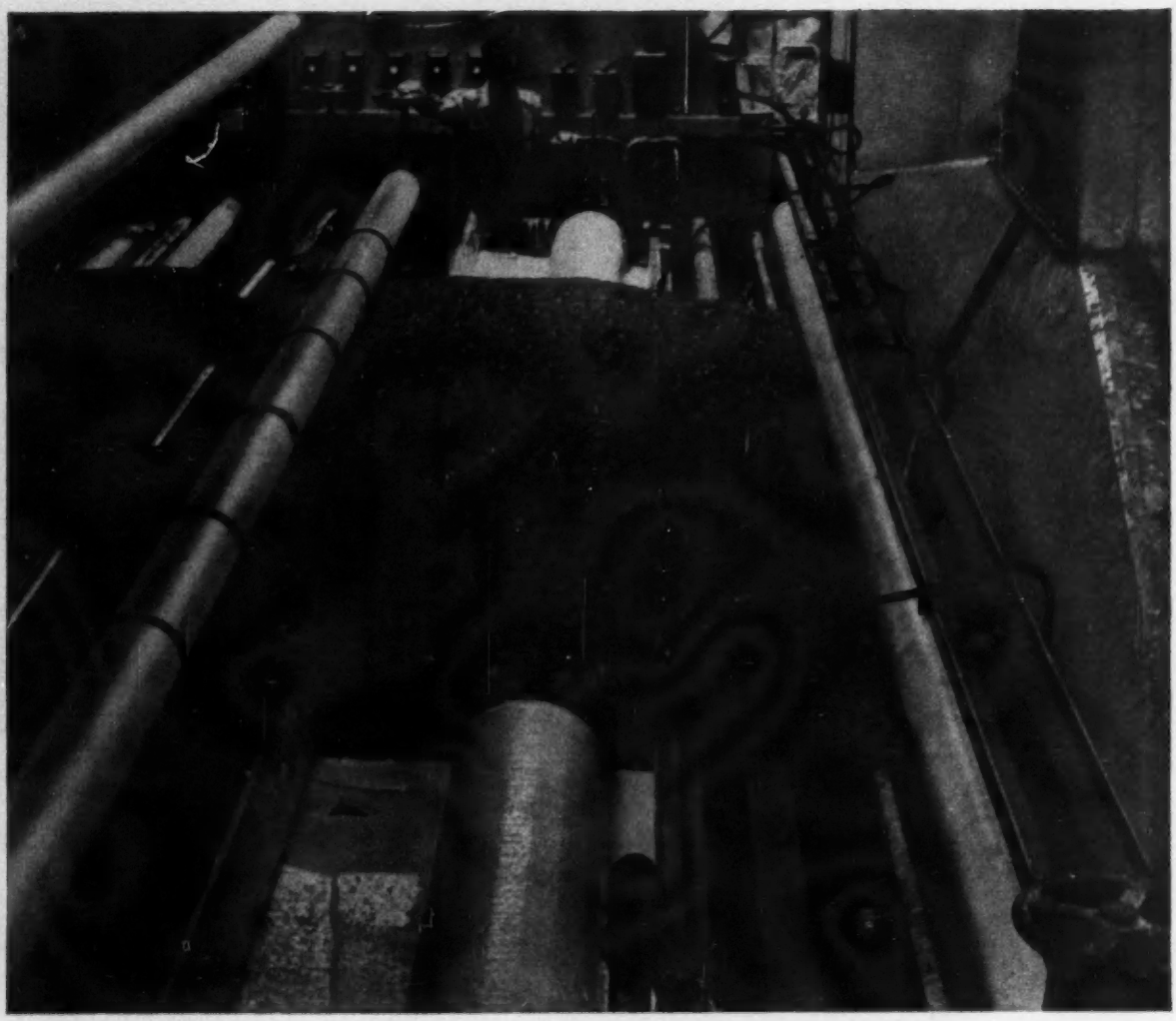

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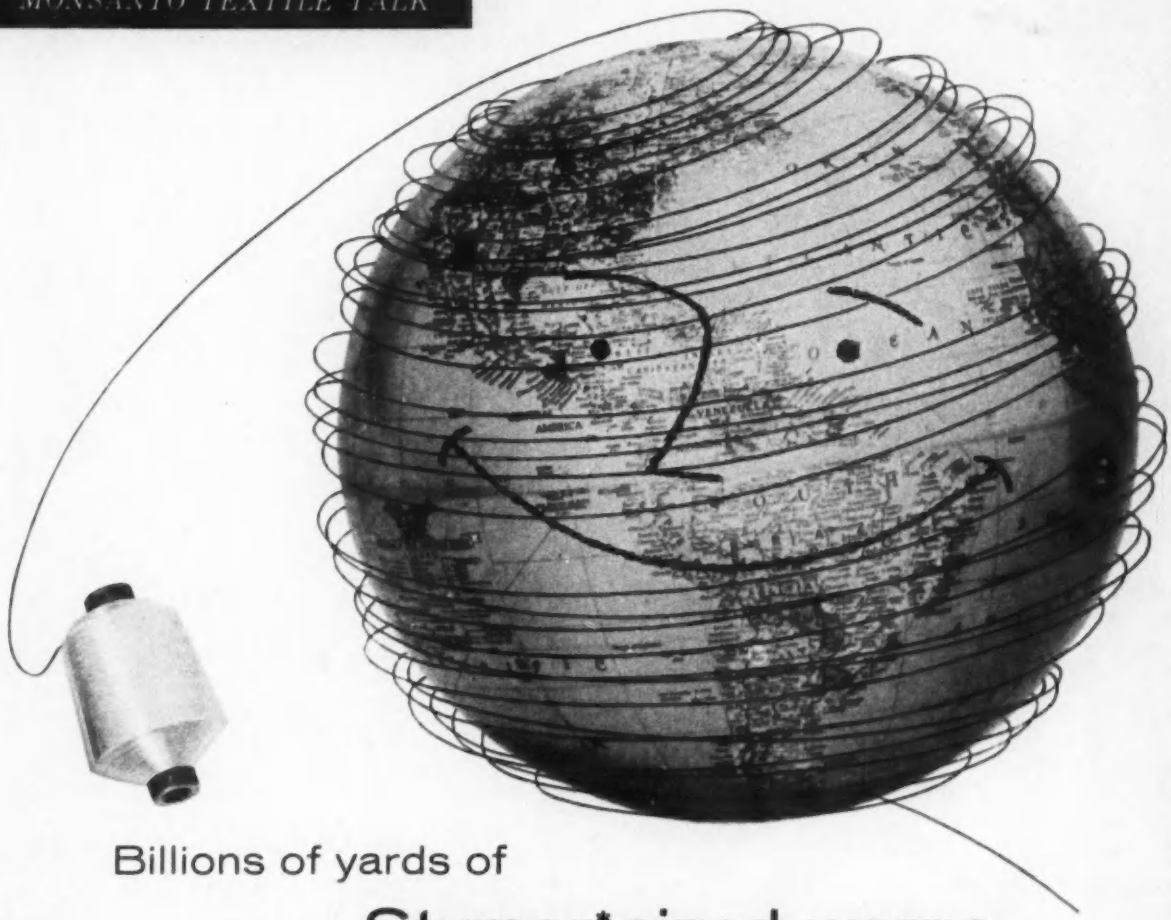

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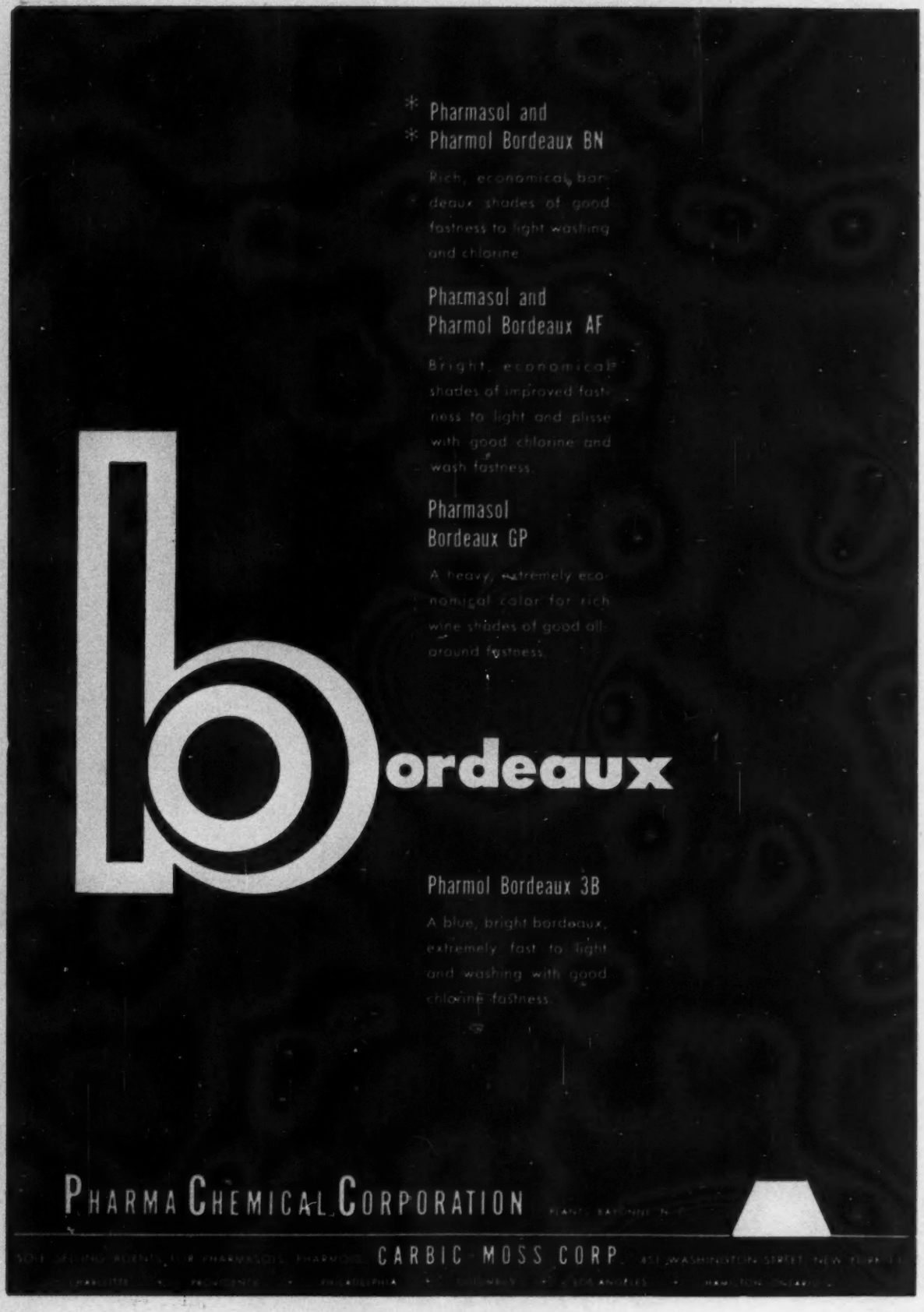
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AATCC Newsgram

May 23, 1955

NEWS IN GENERAL

Local sections will benefit from a new proposal which has been submitted to Councilors for approval by letter ballot. Under the proposal the Sections may request reimbursement for certain expenses incurred by them in the year ended May 1st. For printing, postage and stationery, reimbursement not exceeding seventy cents per each Senior, Junior or Associate member may be requested. They may also include any further expenses, of technical meetings only, not exceeding thirty-five dollars per meeting. The total reimbursement to a Section, however, shall not exceed one dollar and fifty cents per each Senior, Junior or Associate member.

For the expenses of newly organized and accepted Sections the Council may appropriate amounts not exceeding a total of one hundred dollars.

The more liberal reimbursements will add up to a significant increase in the National Association's support of local section activities, if it is desired.

Association officials have moved for the initiation of group life insurance and a participating pension plan for all full-time personnel of AATCC. Plans call for the presentation of the program to the Council at that body's June meeting.

NEWS FROM THE COUNCIL CHAMBER

Council has approved the formation of an Inter-Society Relations Committee, which will have as its function the promotion and regulation of AATCC's relationships with other societies. It has also approved a plan for an enlarged Technical Program Committee, which, in addition to its Convention program duties, would aid local Sections in planning their programs; provide a "speakers' bureau" for the benefit of the Sections as well as other societies and organizations; and provide a "clearing house" to which potential speakers could submit their papers.

In a renewed effort to speed up the publication of papers presented before AATCC, the Publications Committee has instructed that all papers be sent direct to the Managing Editor of the American Dyestuff Reporter. Papers deemed suitable in the form submitted will be processed for publication without delay, while those requiring further editing will be sent to the Editor of Proceedings.

Substantial progress on proof correction of the new Colour Index has been reported, but the problems of binding and marketing have forced a postponement of its publication until next spring.

Newly elected to AATCC membership are 9 Corporate members, 93 Senior, 9 Junior, 28 Associate and 36 Student. 12 members have transferred to Senior membership from other classifications.

COMMITTEE NEWS

New committee appointments announced at last month's Council meeting include: President's Advisory Committee——J A Woodruff, replacing C N Rabold; Publications Committee——J H Jones and E W Lawrence. The Corporate Membership Committee now consists of A E Johnson, chairman, W B Amos, J Anderson, E A Chevrette, A A Curt, J L Eich, R R Frey, C Hooper, J G Kern, E A Leonard, J R Nehmens, W M Segall, R A Shimp, R B Taylorson, and J M Washburn, Jr. A W Etchells heads the Technical Program Committee for the forthcoming Atlantic City Convention, assisted by M H Klein, P Theel, S G Turnbull, Jr, and G G Wunsch.

The Publicity Committee now has representatives throughout the country, so as to adequately handle all local as well as national publicity. This Committee, headed by J A Doyle, chairman, and T R Scanlan, Jr, vice chairman, consists of the following members: R V Dugdale, J C Fonville, M R Hallinan, A N Henschel, K A Howry, A E Johnson, E R Kaswell, J G Kelley, D S Lyle, T M Marshall, J J McGuinness, N W Pratt, J O Sweitzer and A R Thompson.

AATCC CALENDAR

COUNCIL
June 17 (Hotel Statler, New York, N Y); Wednesday evening, Sept 21 (Chalfonte-Haddon Hall, Atlantic City, N J); Nov 18, Jan 20 (Hotel Statler, New York, N Y); Apr 20, 1956; June 15, 1956.

NATIONAL CONVENTIONS
Sept 22-24, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J); 1956 (Waldorf-Astoria, New York); 1957 (Boston); 1958 (Chicago); 1959 (Washington, DC—tentative).

HUDSON-MOHAWK SECTION
June 17 (Annual Outing—Normanside Country Club).

MID-WEST SECTION
June 11 (Annual Outing—Lake Lawn Lodge, Delavan, Wis); Oct 29 (Bismarck Hotel, Chicago, Ill).

NIAGARA FRONTIER SECTION
June 24 (Outing).

NEW YORK SECTION
June 17 (Outing—North Jersey Country Club, Wayne, N J).

NORTHERN NEW ENGLAND SECTION
June 10 (Annual Outing, Wachusett Country Club); Oct 14; Dec 9.

PACIFIC SOUTHWEST SECTION
June 3, Oct 7, Feb 6 (Gourmet Restaurant, Beverly Hills, Calif); Dec 2.

PHILADELPHIA SECTION
Oct 21 (Penn-Sherwood Hotel); Dec 2, Jan 13 (Kugler's Restaurant).

PIEDMONT SECTION
June 10-11 (Mayview Manor, Blowing Rock, N C); Oct 29 (Hotel Wm R Barringer, Charlotte, N C).

RHODE ISLAND SECTION
June 10 (Annual Outing, Pawtucket Country Club, Pawtucket, R I); Oct 13, Dec 1 (Johnson's Hummocks, Providence).

SOUTH CENTRAL SECTION
July 29-30 (Lookout Mtn Hotel, Chattanooga, Tenn; Dec 10 (Hotel Patten, Chattanooga, Tenn).

SOUTHEASTERN SECTION
June 3-4 (Annual Outing, Radium Springs, Ga); Sept 10 (Ralston Hotel, Columbus, Ga); Dec 3 (Atlanta Biltmore, Atlanta, Ga).

WESTERN NEW ENGLAND SECTION
May 13 (Ladies Night); June 17 (Annual Outing); Sept 16 (Rapp's); Nov 4 (Hartford, Conn); Dec 16 (Rapp's).

NOTE

The date of the Hudson-Mohawk Section's annual outing has been changed from June 24th to June 17th. It will be held at the Normanside Country Club.

ACTIVITIES OF THE LOCAL SECTIONS

NORTHERN NEW ENGLAND—LTI STUDENT CHAPTER———Four graduate students at Lowell Technological Institute presented 15-minute papers to mark the evening program, as the Northern New England Section and the Lowell Technological Institute Student Chapter met on April 22nd for their annual joint meeting at LTI. (See photos on page P368).

Speakers and their papers included Charles P Riley, Jr, "Selectivity Factor — Its Influence on Padding"; Thomas F Garvey, "The Modification of Fabric Properties by Additives in Resin Treatments"; Andre J Pelletier, "The Effect of Dye Structure on the Dyeing of Orlon 42"; and John W Gates, "The effect of Structure on the Dyeing Properties of Wool Dyes."

LTI students had charge of the entire program for the meeting, as is customary at this annual affair.

A forum meeting was held in the afternoon on the subject, "The Effect of Dye Structure on Dyeing Properties." Following a five-minute summary by each panelist, the forum was opened for discussion from the floor. Panel members, all undergraduate students at LTI, included Alan A Denio, *chairman,* Nancy J Geary, Piet B Bodenhorst, John L Twarog, and Chester J Petkiewicz.

Dean Charles F Edlund of LTI welcomed members and guests at dinner, which was served at the Institute cafeteria.

The Northern New England Section will hold its annual outing on June 10th at the Wachusett Country Club, West Boylston, Mass. The all-day event will feature a golf tournament, softball game, and horseshoe pitching contest. A buffet luncheon will be served from noon to 2 pm, and dinner will be served at 7 pm.

The following members constitute the Outing Committee: Henry X deRedon, Ciba Co, Inc, chairman; John M Gould, Barre Wool Combing Co Ltd, chairman ex-officio; John Ormiston, Sandoz Chemical Works, Inc, golf; John J Murphy, United Aniline Co, softball; Hans Walls, Sagamore Color & Chemical Co, horseshoes; John R Markgren, W C Durfee Co, dining; Frank Benvie, General Dyestuff Co, and David J Collins, Atlas Color & Chemical Co, prizes; John Sheehy, Pacific Mills, program; Edward M Lynch, Jr, The Derby Co, Inc, and Frank J O'Neill, Pacific Mills, publicity; John P Ploubides, Pacific Mills, finance; and John Dalton, Pacific Mills, music.

* * * * * * *

PACIFIC NORTHWEST———An afternoon tour through the Portland Woolen Mills highlighted the April 22nd meeting of the Pacific Northwest Section, which was attended by 32 members.

Following the tour, the group adjourned to the Emerald Room of the Multnomah Hotel, Portland, Ore, for dinner and the regular meeting. Charles H Carter, Jr, president of the Portland Woolen Mills, gave a brief talk on the development nad historical background of his company. He was followed by J Robert Bonnar, General Dyestuff Co, who, as a past president of AATCC, discussed many aspects of the Association's activities.

John L Ayres was named chairman of the Outing Committee, which will make arrangements for the Section's annual outing at the Mt Hood Golf & Country Club.

* * * * * * *

RHODE ISLAND———Approximately 50 students and instructors from four colleges joined 125 members and guests of the Rhode Island Section at a "Student's Night" meeting, which was held on April 22nd at Lippitt Hall, University of Rhode Island, Kingston, R I.

A 2½-hour tour of the University was afforded students and instructors of Bradford Durfee Technical Institute, New Bedford Institute of Textiles and Technology, and Rhode Island School of Design. All three colleges support AATCC student chapters.

Speakers of the evening were Elliot Broadbent, manager, Glenlyon Print Works Division, Sayles Finishing Plants, Inc, on "Whereall Shall a Young Man Wend His Way?" and Raymond W Jacoby, AATCC president, on "New Developments in the Textile Field and the Future it Holds for Students."

* * * * * * *

RISD STUDENT CHAPTER———42 members of the Rhode Island School of Design Student Chapter attended the March 17th meeting, which featured a talk by Alfred J Carbone, Sandoz Chemical Works, Inc, Hudson, Mass, on dyeing, printing and finishing. Three films were shown.

Newly elected Chapter offices include: Damiano Caramante, *chairman;* Edward Costa, *vice chairman;* Raymond B Allen, Jr, *secretary;* and Alan Grover, *treasurer.*

* * * * * * *

1954 Student Contest, Piedmont Section
First Prize Winner——

FACTORS AFFECTING THE FLUORESCENCE OF COTTON*

GEORGE H LOURIGAN

School of Textiles, North Carolina State College
Raleigh, North Carolina

It has already been observed by others that raw cotton from different crops and cotton of different ages differ in the kind and degree of fluorescence that can be observed visually or photographically under ultraviolet radiation. The author's work indicates that cottons of different dyeing properties also differ in fluorescence. To get some fundamental information on the fluorescence of cotton that may lead to further study of the relation of fluorescence to dyeing, he has conducted experiments which indicate that the fluorescence of cotton increases with experimental degradation and that the degradation products are more water-soluble than pure cellulose.

INTRODUCTION

IT HAS long been recognized that textile fibers exhibit interesting fluorescent characteristics. The causes of fluorescence, however, are by no means completely clear. A number of investigations have been carried out relative to the causes of and changes in this property that might be brought about by certain treatments. For example, it has been shown that heat *(1)*, mercerization *(2)*, and oxidation *(1)* all change the fluorescence characteristics of cotton fibers. Moreover, it is known that raw cottons from various regions of growth do not appear the same under ultraviolet radiation. This has found practical application in differentiating old and used cotton from new cotton materials. The old cotton has a bright, white color under the ultraviolet lamp; the new appears blue *(1)*.

In an investigation of dyeing problems made recently for a North Carolina mill,

* Winner of first prize at the Annual Student Contest held by the Piedmont Section in the Hotel Roanoke in Roanoke, Va. on April 10, 1954.

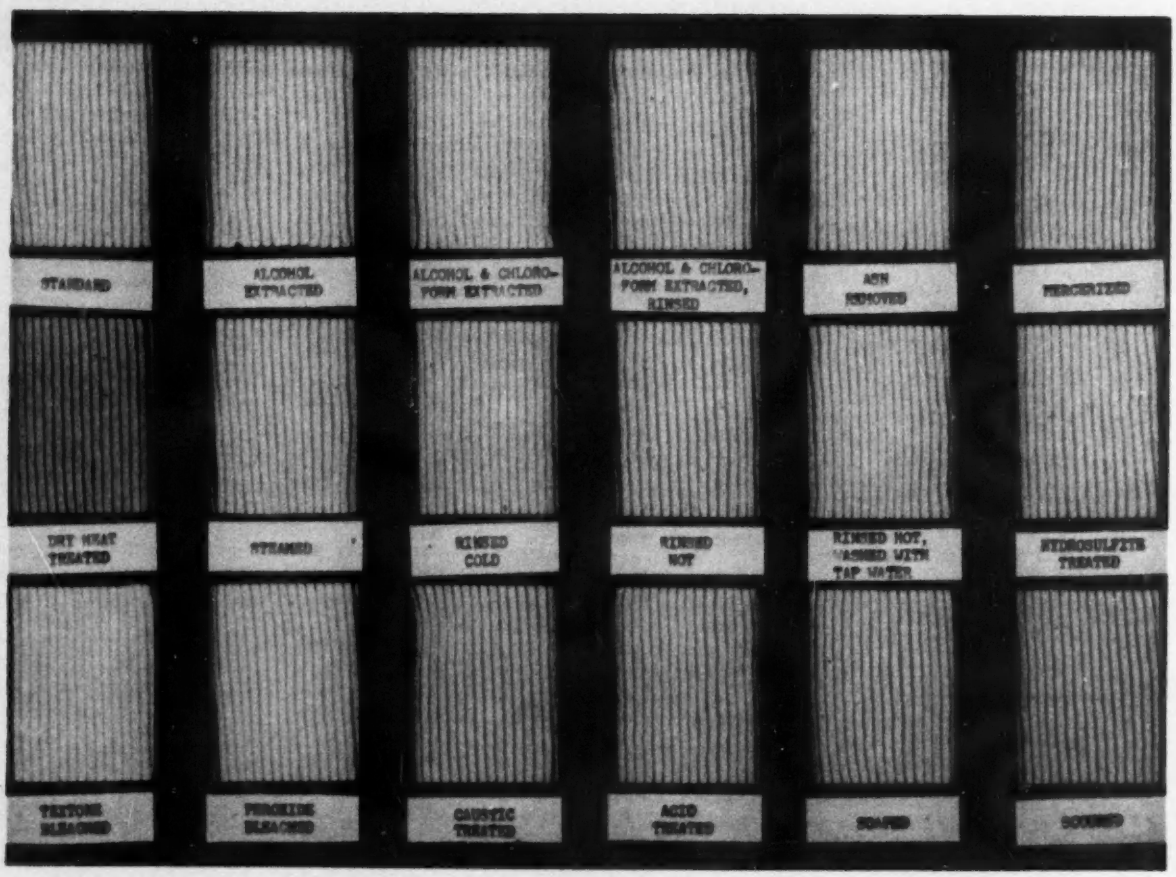


Figure 1
Appearance of samples irradiated with visible light

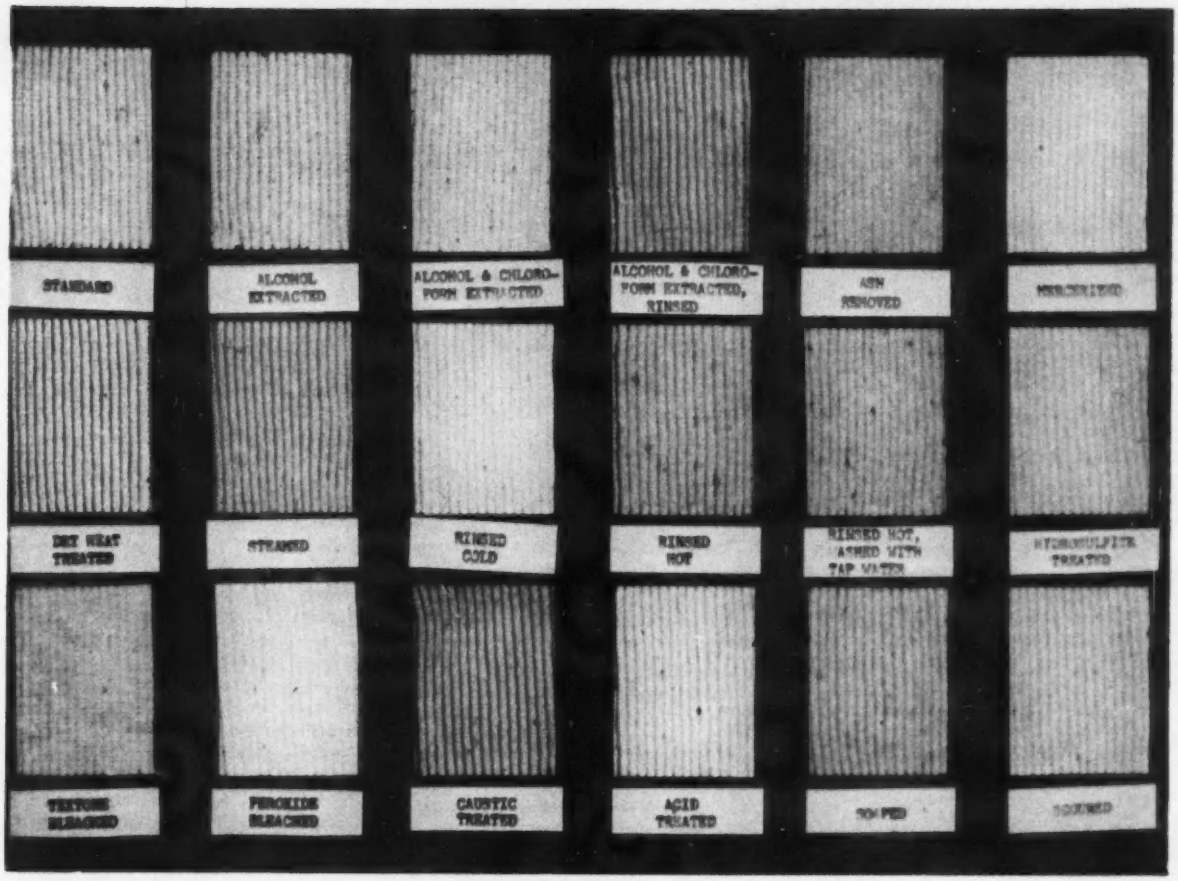


Figure 2
Appearance of samples irradiated with ultraviolet radiation

it was noted that cottons of different crops harvested from the same area dyed differently. Since the fluorescent characteristics of these cottons varied widely, it was possible to prevent mixing by examination of a sample from each bale under an ultraviolet lamp. As a result of this simple test, the dyeing difficulties have been completely eliminated. This would seem to indicate that there may be some relationship between fluorescence and dyeing characteristics. It appears that further investigation of factors affecting cotton fluorescence might uncover evidence to prove or disprove this suspected relationship.

In order to initiate such a study, it might be well to review briefly the mechanism of fluorescence. Ultraviolet radiation is comprised of rays having wave lengths of less than 400 millimicrons. These rays are invisible because the vibrations are too rapid and the wave lengths too short to impress the retina of the human eye *(3)*. Any material capable of absorbing ultraviolet radiations and converting them to visible light is said to be fluorescent.

TABLE I

SAMPLE NUMBER AND TREATMENT

1) Extracted with ethyl alcohol in a Soxhlet extractor for 4 hours.
2) Extracted with hot ethyl alcohol for 4 hours; extracted with hot chloroform for 4 hours.
3) Extracted with hot ethyl alcohol for 4 hours; extracted with hot chloroform for 4 hours; given 4 rinses of 30 minutes each with distilled water.
4) Rinsed in running tap water for 30 minutes; given 3 rinses in 1% solution of acetic acid; rinsed 3 times in distilled water.
5) Treated in a 22% solution of caustic for 3 minutes at 75°F; rinsed in running tap water.
6) Heated at 210°F for 2 hours.
7) Steamed for 2 hours in an autoclave.
8) Given 4 rinses of 30 minutes' duration in distilled water at 70°F.
9) Given 4 hours of 30 minutes' duration in boiling distilled water.
10) Given 4 rinses of 30 minutes' duration in boiling distilled water; rinsed in tap water for 30 minutes.
11) Treated with 4% sodium hydrosulfite at 185°F for 30 minutes; rinsed in tap water.
12) Treated in a solution of 0.25% Textone, 1.1% Nacconol NR, and 2% acetic acid at 190°F for 1½ hours; rinsed in tap water.
13) Treated with 2% sodium silicate and 3% hydrogen peroxide for 1 hour at 205°F; rinsed in tap water.
14) Treated with 4% sodium hydroxide for 2 hours at a boil; rinsed with distilled water.
15) Treated in 5N hydrochloric acid for 30 minutes at 125°F.
16) Soaped with 1% soap for 30 minutes at 180°F; rinsed in tap water.
17) Treated with 1% Calgon, 1% caustic, 1% pine oil for 1 hour at 205°F; rinsed in tap water.

EXPERIMENTAL PROCEDURE

In an attempt to determine the effect of industrial and laboratory processes upon fluorescence, the following experiments were conducted:

Samples of knitted tubing made from 30/2 Deltapine 15 cotton yarn were processed as shown in Table I.

(Concluded on page P359)

Atlanta Convention—
"Finishing of Textiles"

FINISHING FABRICS OF MAN-MADE FIBERS*

J H ANDREEN and L D SWAN

Textile Fibers Department
E I du Pont de Nemours & Co, Inc
Wilmington, Delaware

With the commercial introduction of fabrics prepared from man-made fibers, new techniques in fabric finishing are required to present the desirable textile properties contributed by these fibers with maximum, permanent aesthetic appeal in end-use fabric form.

The polymers from which the new fibers are made possess inherent properties which make the fibers subject to change by a variety of treatments, including mechanical working, heat, and chemical reaction. Innovations in finishing techniques based on these properties are aimed toward enhancing such fabric characteristics as liveliness, resilience, dimensional stability, handle, and resistance toward pilling.

Several new finishing techniques are described. Practical methods for carrying them out on a commercial scale are outlined, and laboratory tests for evaluating the results of the treatments are discussed.

INTRODUCTION

WITH the introduction of man-made fibers, new properties in textiles have become available to finishers of apparel fabrics. Some of these properties, such as shape-retention characteristics developed by heat stabilization, were recognized for their value by the fabric manufacturers at early stages of synthetic-fiber development. Other properties, however, such as water insensitivity and smooth fiber surfaces, at first appeared to limit fiber versatility, particularly with respect to fabric effects normally achieved by conventional methods of dyeing and finishing. However, additional experience shows that fabrics containing "Orlon"[1] acrylic fiber and "Dacron"[1] polyester fiber can be handled in ways which provide desirable aesthetic qualities along with high durability and excellent wash-wear performance. It is the purpose of this paper to discuss the research and developments that make this possible and to illustrate in one or two cases how fabric quality has been improved by making the best use of the changes in fiber properties which can be effected by fabric-finishing procedures.

[1] Du Pont registered trade-marks

* Presented by J H Andreen before the Symposium on Finishing of Textiles, which was held in the Empire Room of the Atlanta Biltmore Hotel, Atlanta, Ga on Sept 16, 1954 with Nelson F Getchell presiding.

CHANGING FIBER PROPERTIES

FIBER THERMOPLASTICITY——Fibers of "Orlon", "Dacron" and nylon are thermoplastic; they will relax, swell and shrink, and they possess a partially crystalline character subject to variation in amount and kind. The principal agents that affect changes in such properties are heat, mechanical work, and chemicals. For example, the crystallinity of polyethylene terephalate is increased by the application of heat, as shown by X-ray analyses of "Dacron" fibers exposed to increasing temperatures. The trend of crystallinity vs temperature is shown in Figure 1. Modulus is another intrinsic property which changes profoundly through textile processing, as shown by Hoffman and Beste (1). The chart shown in Figure 2 follows the decrease in modulus of nylon yarn through weaving and dyeing. Heat is an effective agent in changing modulus values, as illustrated by Table I, which shows how the modulus of "Dacron" fiber decreases when the yarn is exposed to increasing temperatures.

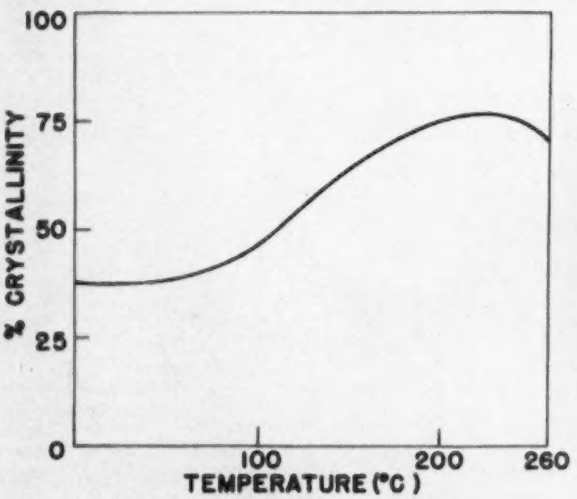


Figure 1
Effect of heat on the crystallinity of "Dacron" polyester fibers

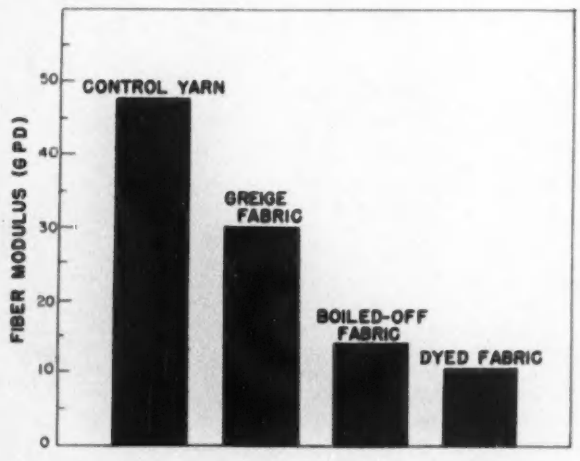


Figure 2
Change of nylon 66 fiber modulus in processing

TABLE I

EFFECTS OF TEMPERATURE IN BOILING-OFF "DACRON" POLYESTER YARN

Treatment (45 min)	M	T	E
water 60°C	52	2.3	16
water 75°C	26	2.7	31
water 85°C	28	2.4	32
water 95°C	21	2.3	39
oil 127°C	9	2.0	52

M—Tensile modulus in g/den (per 100% elongation)
T—Tenacity in g/den
E—Percent elongation at break

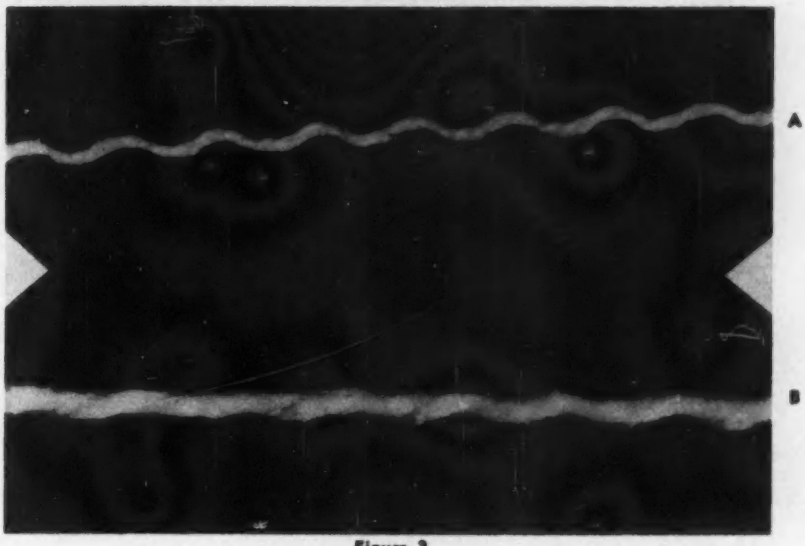


Figure 3
Yarns from fabrics of "Dacron"
A—Heat treated B—Not heat treated

It is of practical interest to the finisher that, as these changes in properties occur, fibers become more readily extensible, yet develop an increased power to recover from deformation. Further, they become dimensionally stable to wet processing or laundering in everyday use. The grosser changes that occur when heat is applied to a fabric are also evident. For example, the heat treatment of fabrics in a relaxed state develops a permanent and well-defined yarn crimp, and changes to some extent the frequency of the crimp, as shown by the shapes of fibers extracted from heat-treated and untreated fabrics of "Dacron" (Figure 3).

EFFECTS OF CHEMICAL TREATMENTS——Gross dimensional changes are also caused by certain chemical treatments on "Orlon" or "Dacron", as illustrated by the action of phenolic-type compounds (Figure 4).

FINISHING TECHNIQUES

All of these changes can be utilized to advantage by the finisher. Of the effective agents, let us consider heat and mechanical working and illustrate how they can be used to best advantage in finishing fabrics of man-made fibers. At elevated temperatures, "Dacron" polyester fibers and "Orlon" acrylic fibers exhibit plastic flow and can therefore be more readily deformed by application of mechanical work than at ordinary temperatures. It has been found that application of heat causes fibers to shrink and to change in crystalline character with the release of strains introduced during yarn and fabric processing. Furthermore, it is recognized that the configurations established in the fabric by heat setting are permanent, provided the temperatures experienced in finishing are not exceeded in subsequent end use. It is now certain that advantages other than dimensional stability can be obtained by heat, and our current finishing research is directed toward making the best use of property changes caused by heat in developing a practical sequence of finishing operations which will produce desirable fabric handle, drape, and resilience, along with a minimized tendency to fuzz or pill.

Fabrics of "Dacron" staple are being heat treated at increasingly higher temperatures where liveliness characteristics are markedly improved, as shown by samples which were framed at 250 and 380°F with allowance for shrinkage in both warp and fill. Other property changes are evident (Table II), particularly a significant improvement in pill resistance. Pill test results are shown for two conditions of testing: 5/5 indicating 5 minutes' brushing followed by 5 minutes' sponging, and 5/60, 5 minutes' brushing, and 60 minutes' sponging, respectively. Although heating in the range of 380°F contributes much toward pilling improvement, a still greater improvement, as shown by wear performance, can be achieved by wire-brushing the fabric surfaces prior to heat relaxation. An effective brushing operation for obtaining maximum pill resistance makes use of a cylindrical high-speed rotary wire brush. Essentially, this is a modified "tiger" brush, such as is used in finishing plushes, which rotates in opposition to the direction of

TABLE II

EFFECT OF BRUSH-HEAT PROCESS ON FABRIC PROPERTIES
—100% "DACRON", 2X2 TWILL—

	Control Fabric	Test Fabric
flexural rigidity, G (mg/cm)	201	166
liveliness, L (cm/sec)	66	97.9
$L/\sqrt{G}$	4.7	7.6
crease recovery (15 sec) %	71.5	74
pills (per sq in)		
5/5 (as finished)	0	0
5/60 (after 5 washings)	2.0	0.2

Test fabric——wire brush, scour and dye, extract and dry at 250°F, frame at 380°F (5% shrinkage), brush and shear, semidecate.
Control fabric——same finishing sequence without wire brush and 380°F framing.

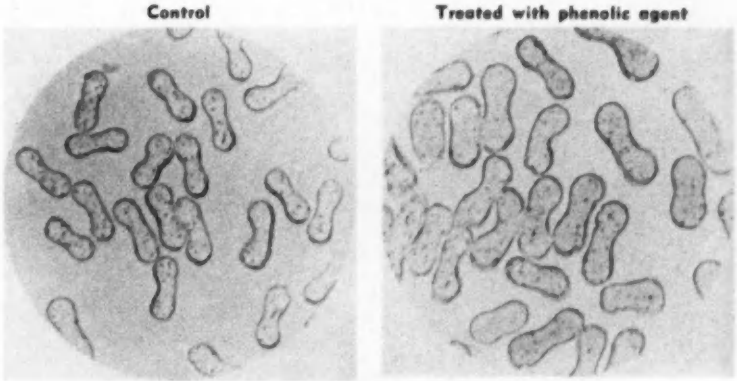


Figure 4
Effect of swelling agents on "Orlon" acrylic fiber

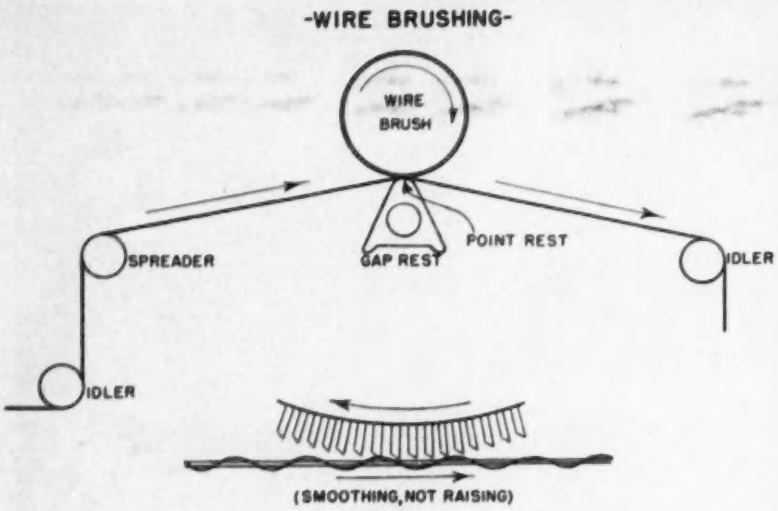
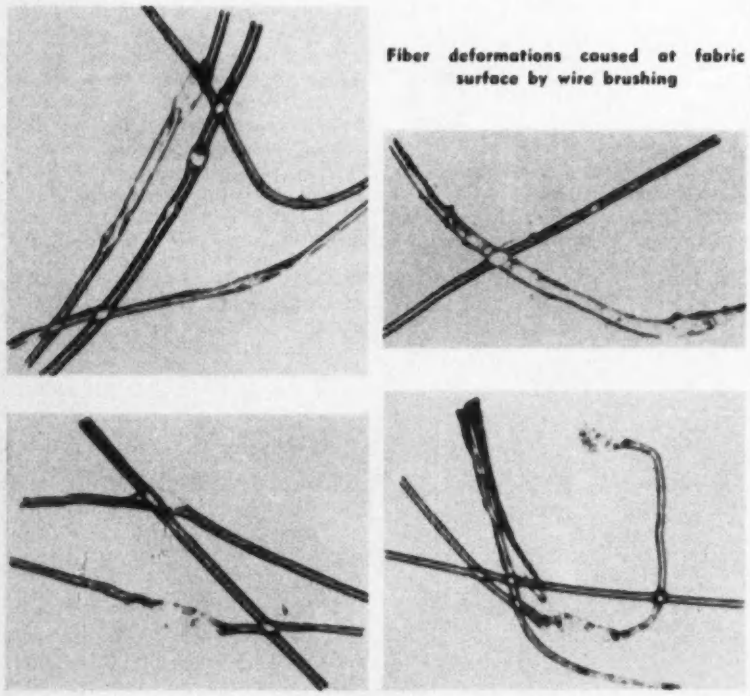


Figure 5

fabric travel at a peripheral speed approximately 60 times faster than the fabric speed (Figure 5). The wire brush was so ground that a smooth heel-to-toe polishing action rather than a plucking action was obtained by the motion of the brush against the fabric; no appreciable napping resulted from this brushing technique. It is believed that one function of the wire brush is to lift individual fibers from the surface of the fabric, which would otherwise pill in wear. These fibers are ultimately sheared in the conventional sequence of finishing procedure. Because the fibers are thermoplastic, the polishing action of the wire brush served a second function. The mechanical work performed by wire brushing, together with the frictional heat developed, changed the shape of many filaments retained in the exposed surfaces of the yarns (Figure 6). It is believed that these irregularities served to help lock the surface fibers into the fabric in a more permanent fashion than would be expected in the case of smooth, round filaments. The surface fibers are therefore less free to work out of the fabric, to entangle with their neighbors, and to form pills.



Fiber deformations caused at fabric surface by wire brushing

Figure 6

After wire brushing, fabrics were heat treated on an enclosed pin tenter at 350 to 390°F with exposures from 30 to 60 seconds. Best results were obtained when allowance was made for 3 to 7% shrinkage in both warp and filling directions. It is essential that uniform temperature control from side to side be maintained to avoid differences in depth of shade when the fabric is dyed.

Application of these combined finishing steps to greige fabric permits maximum utilization of fabric shrinkage without harshening the fabric handle. As noted, where both brushing and heat treating are used, the heating step should follow the brushing operation. This sequence can be used after scouring, after dyeing, or prior to final shearing. Heat treatment after dyeing demands close attention to the proper selection of dyestuffs and heat-setting conditions to avoid dye-sublimation difficulties.

REDUCTION OF PILLING

BRUSHING AND HEATING——The combined brush-heat procedure has been applied to plain weaves, 2 x 1 twills, and sheen gabardines in suitings, and to batistes, Oxfords, and basket weaves in shirtings. One-hundred-percent-"Dacron" polyester fiber and blends of "Dacron" with cotton, rayon, and wool represented the range of fabric compositions subjected to this treatment in our preliminary work. In all cases markedly improved pill resistance and a greatly reduced tendency to fuzz were achieved as indicated by laboratory pill tests (Table III). Treated fabrics are now on wear test; and, although the test is not complete, certain of the garments called in after numerous wearings and washings demonstrated the effectiveness of the treatment.

Evaluation of commercial wire-brushing equipment (other than the modified "tiger") included machines such as the despecker, vertical napper, and planetary napper. The choice of brushing equipment and its specific method of use depend, of course, on the type of fabric to be finished. In addition to the pin tenter, other methods of heat setting are being evaluated.

DYEING——New continuous dyeing techniques, such as the Thermosol and "Hertaine" processes also improve pill resistance on fabrics of "Dacron" because they operate at high temperature.

TABLE III

EFFECT OF BRUSH-HEAT PROCESS ON PILLING

	Pills/sq in after 5-min brushing and 5-min sponging	
	Test	Control
100% "Dacron" batiste shirting	1	5
65/35 "Dacron"/cotton batiste	0	2
65/35 "Dacron"/cotton oxford	0	3
100% "Dacron" tropical suiting	1	2
70/30 "Dacron"/rayon 2x1 twill suiting	0	1
65/35 "Dacron"/rayon 2x2 twill suiting	0	3
55/45 "Dacron"/wool 2x2 twill suiting	1	6
55/45 "Dacron"/wool 3x2 sheen gabardine	0	1

Test: greige fabrics were brushed, heat treated, and conventionally finished.
Control: conventionally finished.

TABLE IV

EFFECT OF WET FULLING AT 150-180°F ON FABRICS OF "DACRON" POLYESTER FIBER AND "ORLON" ACRYLIC FIBER

	2 x 1 twill of "Dacron"		Plain weave of "Orlon"	
	Conventionally finished	Fulled after finishing	Conventionally finished	Fulled after finishing
average bending length (cm)	1.78	1.72	1.39	1.2
flexural rigidity G (mg/cm)	132	125	32	23
liveliness, L (cm/sec)	77	113	35	38
$L/\sqrt{G}$	6.7	11.6	6.2	7.9

SINGEING———Singeing is another very important single finishing procedure which reduces pilling. A deep, thorough, evenly applied singe, preferably with two flame exposures, is often necessary to achieve good pill resistance. Where possible, shearing should precede the singeing operation in order to insure against a harsh, grainy fabric caused by large, melted fiber tips (Figure 7). Singeing has also been performed in sequence with the brush-heat process with most encouraging results.

Although the importance of yarn twist and fabric construction should still be emphasized in preparing pill-resistant fabrics, the finishing methods just described have been applied successfully to a wide variety of fabric types to yield improved fabric handle, drape and pill resistance.

FINISHING IN GENERAL———Heat and mechanical work applied in other ways offer advantages in the finishing of fabrics containing synthetic fibers. The fulling mill, for example, provides a type of compressional working which we have supplemented with heat. This experimental development originated with the observation that fabrics of "Orlon" acrylic fiber and "Dacron" polyester fiber could be softened by repeated ironing, followed by hand working between each application of the iron.

Similar results were obtained on a larger scale when these conditions were approximated to some degree in the experimental fulling mill (see Figure 8). This mill has stainless-steel insulated walls and is provided with strip heaters, over which the contained air is cycled continuously during the fulling operation (Figure 9). Fabric samples of 100% "Orlon" and "Dacron" illustrate the improved handle achieved when fabrics were fulled wet with soap and water at 150 to 180°F. Changes in fabric properties are shown in Table IV.

Although softness was achieved in all fabrics, fabric resilience was improved only in certain fabric constructions. As these fabrics were not tightly woven, they allowed space within the fabric in which the individual yarns could be worked, opened, and distorted.

A lightweight fabric of "Orlon" possessed a particularly soft luxurious handle, obtained by fulling. The fuzzy surface developed was purposely retained. A clear finish was obtained on a similar fabric, which was finished by a sequence of steps, including wire brushing, shearing, singeing, and bleaching. Shirts of this fabric, which have been on wear test, continue to resist objectionable fuzzing. This fabric possessed a very decidedly high level of whiteness. It was obtained by an established mill bleach for "Orlon" and was stable to an exposure of 20 Fade-Ometer hours, breaking only slightly within this time. Most frequently the original break does not become any more severe between 20 and 40 Fade-Ometer hours. This shows that a much improved white of increased brilliance can be obtained without sacrificing durability in the Fade-Ometer. Excellent bleaching was accomplished with Mathieson's Textone sodium chlorite and nitric acid. Brilliance was then obtained by tinting the fabric with "Sevron"[1] Blue B, a bright, fast dye for "Orlon."

In addition to the two or three finishing steps described, other experimental techniques based on the use of conventional finishing machinery have also produced fabrics of greater aesthetic appeal and better wearing quality. These improvements were achieved by the application of temperatures, pressures and times in excess of those ordinarily used in established procedures. This has demonstrated that, in many instances, the finishing of fabrics containing man-made fibers has not been effective in bringing out the aesthetic qualities that these fibers offer.

[1] Du Pont trade-mark

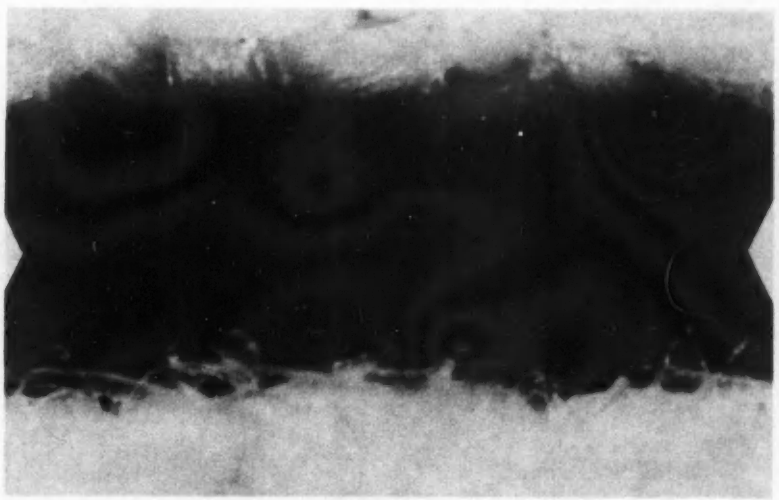


Figure 7
Singed surfaces of fabrics from "Dacron"
A—Singed after shearing B—Singed but not sheared

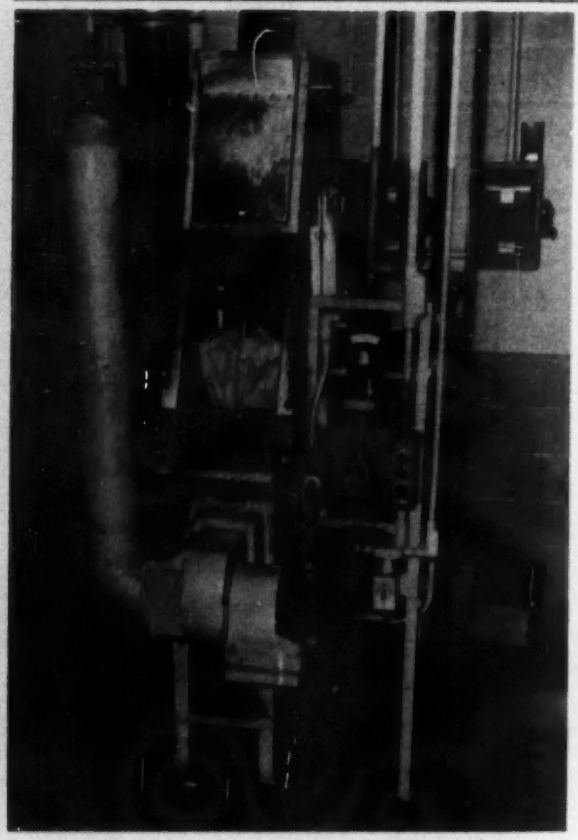


Figure 8

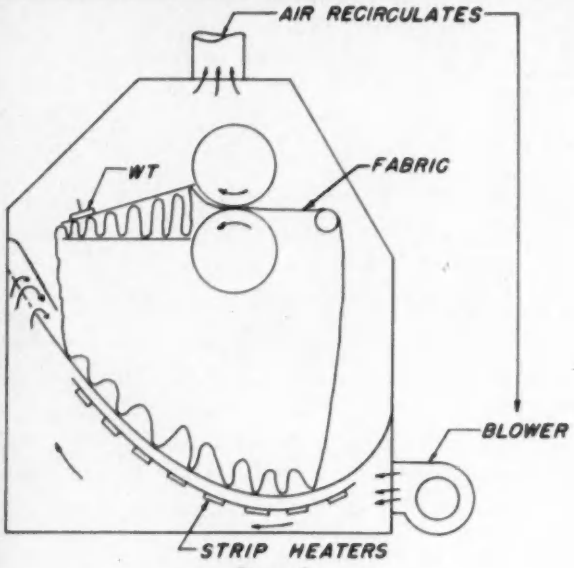


Figure 9
Lab scale hot-fulling mill

CONCLUSION

The properties of fabrics of man-made fibers can be modified so that optimum quality in commercial fabrics can be produced, not only by the appropriate choice of construction variables, but by selecting the proper conditions for the application of finishing agents, such as heat and mechanical work. As might be expected, the new fibers respond to finishing conditions which are, to some degree, different from those conventionally practiced. In our own laboratories we are continuing to seek optimum finishing conditions for the different types of fabrics in which our fibers are used, with the development of practical application methods as our goal. After satisfactory demonstration on a commercial scale, new techniques will be suggested to augment the researches of the textile industry, aimed toward increased consumer satisfaction through improved fabric quality.

REFERENCE

(1) Hoffman, R M, and Beste, L F, "A Quantitative Study of Resilience", *Textile Research J* 20, 441 (1950).

DISCUSSION

Question: What was the "Orlon" fabric you showed; was it bleached?

Answer: That was an 85-15 "Orlon"-cotton fabric, which had been bleached by the use of Textone and nitric acid, as I have already recommended. This method gives the best basic white that has been seen. Brilliance was enhanced by tinting with "Sevron" Blue B, a basic dye for "Orlon."

Q: Do you know if that white is permanent, or does it yellow with age?

A: This is an excellent white, which yellowed only slightly in 20 hour of Fade-Ometer exposure. It showed little increase in yellowness between 20 to 40 hours. Any slight yellowing that may develop can be removed by bleaching again.

Q: What methods were used in measuring liveliness and flexural rigidity?

A: The liveliness measurement is one in which the fabric is bent around a plate through 180° and then is released in front of a photoelectric cell. Liveliness is expressed in centimeters per second, the speed at which the sample crosses the beam of the photocell.

Flexural rigidity is derived from the bending length and the weight per unit area of the fabric. It is defined as the moment of the couple required to bend a strip of fabric of unit width to a circle having unit radius.

Bending length is defined as the length of a strip of fabric which would be required as a horizontal cantilever to cause the fabric to leave its support on a curve having unit radius. The bending lengths and flexural rigidity data reported were determined by suspending a strip of fabric in a heart-shaped loop (the "hanging-heart" test).

Q: What time of exposure is used in heating "Dacron" to 380°F?

A: Ordinarily for most fabrics, 45 seconds at 380°F on a pin tenter frame.

Q: Is the fabric relaxed in that operation, and, if so, by how much?

A: Yes, usually, by 5 to 7% according to the fabric type. Temperatures and heating time are controlled to avoid the development of harsh fabric handle.

I would like to add a word of caution in the application of high temperatures. You will note that the fabric was treated at high temperature by framing *after* dyeing because we know from the published quantitative work of Imperial Chemical Industries that the dyeability of the polyester fiber is affected by high temperature. In treating dyed fabric, experimental trials must always be made to determine the effect of heat on the shade. We have encountered no difficulty in treating solid shades of navy and brown.

AATCC Committee on Stream Pollution——

THE BOD OF TEXTILE CHEMICALS

RHODE ISLAND SECTION SUBCOMMITTEE ON STREAM POLLUTION
WILLIAM STAFFORD, *Chm;* HAROLD J NORTHUP, *Secty*

As an aid to textile mills interested in careful and controlled disposal of chemical wastes to minimize stream pollution, the Rhode Island Subcommittee has determined and collected figures for the 5-day biochemical oxygen demand of about 154 textile chemicals.

INTRODUCTION

CONSIDERABLE interest is being shown in the biochemical oxygen demand (BOD) of textile chemicals because of the oxygen-depleting effect of many of these substances on the streams into which they are discharged as wastes. This action is particularly harmful during periods of low river flow and high temperatures.

Numerous requests are being made by textile-mill personnel for the BOD of their process chemicals and dyes. Chemical manufacturers are becoming equally interested in knowing the BOD of their present products and in developing new chemicals with as low BOD as possible.

A study was made by the Rhode Island Sectional Stream-Pollution Committee in order to supply some of the desired information. BOD tests were made at the Sanitary Engineering Laboratory of the Engineering Experiment Station, University of Rhode Island, on samples furnished by a local cotton and synthetics bleaching, dyeing and finishing plant. Most of the chemicals tested were used in the plant processes to the extent of at least 50 lb per day. The eight dyes tested were representative of the various types used. Results of BOD tests by other investigators on detergents, textile and synthetic chemicals are also given to provide a more complete list.

EXPERIMENTAL PROCEDURE AND RESULTS

Care was used to ensure that representative samples of the chemicals and dyes were obtained. The BOD (5-day biochemical oxygen demand at 68°F [20°C]) was determined by the sodium azide modification of the Winkler procedure given in "Standard Methods" *(1)*, with the use of standard dilution water. Samples for dilutions were taken from solutions containing 1000 ppm of the chemicals in distilled water. Those dilutions showing 40 to 70 percent oxygen depletion were considered most reliable *(1)*. Results of these tests are shown in Table I with the designation "URI". Five-day BOD values from other sources are also included in Table I with references. The names of the substances are arranged in alphabetical order for convenience.

The 5-day BOD is reported as percent rather than parts per million in accordance with the precedent of Burford, Masselli and Snow *(2a)*. This procedure gives smaller and more convenient figures, which may be converted to parts per million by multiplying by 10,000. The data give the parts of oxygen absorbed in five days at 68°F (20°C) by 100 parts of chemical (as marketed) through the action of sewage bacteria under specified conditions *(1)*.

The BOD values listed in Table I from reference (6) were computed from the data of Lamb and Jenkins *(6b)* on the percent of the theoretical BOD satisfied in five days, and from the calculated theoretical BOD of the substances. For example, the theoretical BOD of methanol satisfied in five days was given at 53.4%. From the equation,

$$\underset{(64)}{2CH_3OH} + \underset{(96)}{3O_2} = 2CO_2 + 4H_2O$$

methanol was found to have a theoretical BOD of 96/64, or 150%. The calculated 5-day BOD, then, of methanol was $53.4 \times 1.50 = 80\%$.

Lamb and Jenkins *(6)* used 2.5 parts per million of chemicals in all BOD bottles for comparative study. They stated that "considerably greater concentrations of some chemicals would be required in the incubation bottle to obtain 40 to 70% depletion in dissolved oxygen in five days". This would be true of their chemicals with low reported BOD. Although the numerical accuracy of those BOD values may be somewhat less than when the depletion is 40-70%, the results are satisfactory for this study.

After the 5-day BOD tests were completed, it was noted that some types of organic substances have a considerable lag period, when sewage seed is used, before active biochemical oxidation commences *(6, 8)*. The 5-day BOD values do not give a true picture of the oxygen-absorbing capacity of such substances when they are present in a stream *(6a)*. In order to show this clearly, curves giving the relation of the observed BOD to the incubation time of several organic chemicals were plotted (Figure 1,) from the data of Lamb and Jenkins *(6b)*. The chemicals were plotted (Figure 1) from four types of BOD curves mentioned by Mills and Stack *(8a)*. Type I curves result from chemicals that are readily biologically oxidized; Type II curves are obtained from substances that are slow in exerting a BOD; Type III curves are produced by materials with a characteristic lag period when sewage seed is employed; and Type IV curves result from organic compounds that show very little BOD over long incubation periods.

DISCUSSION

Higher BOD values for a given incubation time are generally obtained for organic substances when acclimated seed is used in place of settled sewage seed *(4, 6c)*. However, Lamb and Jenkins did not consider the increase in 5-day BOD sufficient to make the use of acclimated seed a worthwhile practice *(6e)*. Reproducible BOD values are not obtained with the use of river water for dilution because of variations in the flow and composition of the river from day to day *(6d)*. BOD determinations made by the Warburg technique on synthetic detergents give results that are sometimes higher and sometimes lower than those obtained by the standard dilution method *(4a, 4b)*. The latter procedure appears the simplest and most reliable even though some variation in results may occur when different samples of settled sewage are used as seed.

Substances with a high 5-day BOD will definitely cause trouble through oxygen depletion when discharged into streams during periods of low river flow and high temperatures. Materials with a low 5-day BOD should be investigated with regard to their long-term BOD before they are substituted for high-BOD products to reduce stream pollution.

Referring to Figure 1, Mills and Stack state that most synthetic organic chemicals belong to Type I curve *(8a)*. In such cases the 5-day BOD test is suitable. The BOD test for substances with Type II curve should be continued for at least ten and preferably fifteen days. The incubation

TABLE I
THE BOD OF TEXTILE CHEMICALS AND DYES

Name of Chemical	*Chemical Composition and Use*	*5-Day BOD, %*	*Reference*
Acetic acid, 56%	CH_3COOH; dyeing, souring	33; 36	URI; *(3b)*
Acetic acid, 80%	CH_3COOH; dyeing, souring	52	*(5a)*
Acetic acid, 84%	CH_3COOH; dyeing, souring	62	*(3b)*
Acetone	CH_3COCH_3; solvent	122*	*(6b)*
Aerotex Resin M-3	Melamine-formaldehyde; finishing	23	URI
Aerotex Softener H	Mixed cationic-anionic long-chain derivatives; softener	3	*(2a)*
Aerotex Syrup 250 Conc	Urea-formaldehyde condensate; durable finishes	5	URI
Ahcovel G	Fatty carbamide; cation-active substantive softening agent	2	URI
Allyl Alcohol	$CH_2{:}CHCH_2OH$	20*	*(6b)*
Ambertex M	Starch paste; thickening	2	*(2a)*
Amioca	Waxy-maize starch; finishing	7	URI
Aniline Oil	$C_6H_5NH_2$; aniline-black dyeing	150	URI
Anthomine	High-molecular-weight fatty esters and nitrogen compounds; wool-dyeing assistant and leveling agent	9	*(3b)*
Avitex SF	Long-chain alcohol sulfate; softener, finishing	35	*(2a)*
Avitone A	Sodium hydrocarbonsulfonate; softener	0; 3	URI; *(2a)*
B-2 Gum	Starch dextrins; printing inks, size	61	*(2a)*
BP Solvent	Pine-oil mixture; emulsifier	94	URI
Brytex Gum No. 745	Starch; printing inks, size	61	*(2a)*
Butyl acetate	$C_4H_9CO_2CH_3$; solvent	52*	*(6b)*
Butyraldehyde	C_3H_7CHO	106*	*(6b)*
Carbopen	Penetrant; dyeing	2	*(3b)*
Carboxymethylcellulose	Cellulose ether; sizing	3	*(2a)*
Casein	Complex protein from milk; finishing agent	25	URI
Catalyst AC	Nonammonium stable organic salt; catalyst for curing urea- and melamine-formaldehyde resins	2	URI
Cetosol SF	Synthetic resin; finishing	24	*(2a)*
Concental #60	Highly sulfonated organic material; softener and finishing compound	100	URI
Crystal Gum	Converted starch; finishing	9	URI
Dextrin	Converted starch; finishing	50	URI
Diastafor L	Mixture of amylolytic and proteolytic enzymes; desizing agent for starches	2	URI
Diethylene glycol	$O(CH_2CH_2OH)_2$; hygroscopic agent	2*; 6	*(6b)*; *(2a)*
DMU	Dimethylol urea; finishing	10	*(2a)*
Duponol C	Lauryl sulfate; detergent and wetting agent	125	*(4a)*
Duponol D Paste	Long-chain alcohol sulfate; detergent and wetting agent	45	URI
Duponol RA	Long-chain alcohol sulfate; detergent and wetting agent	33	URI
Duraline	Solvent-type detergent	16	URI
DYES:			
Alizarine Cyanine Green GHN Conc CF	Acid dye	near 0**	URI
Kreelon 8G	Same as Kreelon 8D	23	*(4a)*
Kyro AC	Modified fatty amine condensate; washing, fulling	12	*(3b)*
Lanazine Tip	Albumen derivative; dyeing assistant	9	*(3b)*
Leucophor	Optical bleach	33	*(3b)*
Lustramine	Softener	33	URI
Lustrasol	Softener	20	URI
Meleine RS	Aliphatic amino compound; protective agent against acid fading of acetates	30	URI
Merpol B	Alcohol sulfate; wetting	44	URI
Metachloron	Direct-color fixative	0	*(2a)*
Methacrol FNH	Resin Emulsion; finishing agent	4	URI
Methanol	CH_3OH; solvent	80*	*(6b)*
Methyl isobutyl ketone	$CH_3COCH_2CH(CH_3)_2$; solvent	12*	*(6b)*
Monatone A	Built soap gel; detergent, dyeing assistant	20	URI
Monochlorobenzene	C_6H_5Cl; swelling agent in dyeing of Dacron, dyeing assistant	3	*(3b)*
Morpholine	$O{:}(CH_2CH_2){:}NH$; dye solvent, emulsifying agent, corrosion inhibitor	2*	*(6b)*
Naccosol A	Sodium alkylnaphthalenesulphonate; wetting	0	*(4a)*
Nacconol NR	Sodium alkylarylsulfonate; detergent	0; 4	*(7a)*; *(2a)*
Nacconol NRSE	Sodium alkylarylsulfonate; detergent	0	*(4a)*
Nekal NF	Alkylarylsulfonate with organic solvent; wetting, dye assistant	12	URI
Neutronyx 600	Aromatic polyglycol ether; scouring agent for all fibers	0	*(4b)*
Nopco 1656	Soluble fatty ester; spinning	12	*(3b)*
Orvus Neutral Granules	Modified alkylarylsulfonate; detergent	3	URI
Oxalic acid	$H_2C_2O_4{\cdot}2H_2O$; rust removal	14	*(2a)*
Parval	Fatty amine condensate plus amine soap; scouring, fulling	5	*(3b)*
Pearl cornstarch	Starch; printing inks, size	50	*(2a)*
Peregal OK	Cationic ethylene oxide condensation product with an organic amine; dyeing and stripping assistant	2	URI
Pine oil	Pine oil; scouring	108	*(3b)*
Pluronic F 68	Polyglycol ethers; detergent	12	*(4b)*
Proxol T	Mineral oil plus nonionic emulsifier; carding	20	*(3b)*
Rapidase M	Amylolytic and proteolytic enzymes; desizing agent	4	*(2a)*
Red oil	Sulfonated castor oil; soap making, carding	68†	*(3b)*
Resloom HP Special	Melamine-formaldehyde condensate; finishing	11; 14	URI; *(2a)*
Resloom M-75 G	Melamine-formaldehyde condensate; finishing	14	*(2a)*
Rexan O	Ethylene ether condensation product; levcling agent for direct and vat dyes	2	URI
Rhonite 313	Urea-formaldehyde resin; finishing	11	URI
Rhonite 610	Urea-formaldehyde resin; finishing	5	*(2a)*
Rhonite R-1	Modified urea-formaldehyde resin; finishing	7	*(2a)*

Calcogene Black GXCF Conc	Sulfur dye	10	URI
Celliton Fast Blue AF 100%	Acetate color	3	URI
Erie Brilliant Black S 150%	Direct dye	8	URI
Fast Red Salt 3GL	Insoluble azo compound	2	URI
Khaki Carbanthrene 2G	Vat dye	0	URI
Naphthol AS-BR	Prepare	10	URI
Nyaform Blue 2B	Direct dye (formaldehyde aftertreatment)	near 0**	URI
Mixture of 18 dyes	Dyes	7	*(2a)*
Dypenol SED	Polyhydric alcohols and cresylates; mercerizing assistant	39	URI
Elvanol 72-60	Polyvinyl alcohol; finishing agent, sizing compound	1	URI
Ethanol	C_2H_5OH; solvent	93*	*(6b)*
Ethofat C/15	Polyethoxyethanol fatty acid ester; detergent	100	*(4b)*
Ethofat C/60	Polyethoxyethanol fatty acid ester; detergent	22	*(4b)*
Ethomid HT/15	Polyethoxyethanol fatty acid amide; detergent	100	*(4b)*
Ethomid HT/60	Polyethoxyethanol fatty acid amide; detergent	9	*(4b)*
Ethyl acetate	$C_4H_8O_2CH_3$; solvent	66*	*(6b)*
Ethylene glycol	$HOCH_2CH_2OH$; softening, conditioning, yarn lubricant	16*	*(6b)*
Exol XP Special	Detergent	70	URI
Extender No 31	Mineral spirits	8	*(2a)*
Finish TS	Soya bean oil; finishing	39	*(2a)*
Formaldehyde, 37%	HCHO; shrinkproofing, creaseproofing, modifying dyeing characteristics	37	URI
Formic acid, 85%	HCOOH; souring	2	URI
Formopon	$NaHSO_2.HCHO.2H_2O$; stripping, reducing	27	*(2a)*
Glucono Delta Lactone	Delta lactone of gluconic acid	52	URI
Glucose corn syrup	$C_6H_{12}O_6$; assistant for vat dyeing	53	URI
Glycerine, 88%	$CH_2OHCHOHCH_2OH$; print pastes	64	*(2a)*
Iberscour	Detergent	53	URI
Igepal	Polymerized ethylene oxide alkyl phenol condensation product; detergent, wetting agent; emulsifying, dispersing	4	*(3b)*
Igepal CA-630	As above	13	*(4b)*
Igepal CA, Extra High Conc	As above	7	URI
Igepon AP-78	Oleic ester of sodium isethionate	121	*(4a)*
Igepon T-77	Sulfonated amide	166	*(4a)*
Inhibitor M	Ethylene diamine tetra acetic acid	1	*(3b)*
Isopropyl acetate	$(CH_3)_2CHCO_2CH_3$; solvent	26*	*(6b)*
Iversol	Blend of soap, solvents and penetrants	60	*(3b)*
KD Gum	Starch; printing inks, size	57	*(2a)*
Kierpine Extra	Sulfonated tall and pine oils; kiering	61	*(2a)*
Kreelon 8D	Sodium alkylarylsulfonate; detergent; wetting agent, dyeing assistant	15	*(4a)*
Rhozyme LA	Diastatic enzyme in liquid form; starch-desizing agent	2	URI
Rinsol	Detergent; washing	72	*(3b)*
RTC Gum	Starch-urea; printing inks, size	12	URI
Sandopan TLF	Sulfonated fatty amide; detergent, dispersing of acetate colors	5	URI
Sandozol KB	Sulfonated vegetable oil; leveling agent	15	URI
Santomerse 3	Sodium alkylarylsulfonate; wetting, scouring, dyeing	9	*(4a)*
Serizyme	Proteolytic enzyme; protein desizing	2	URI
SOAPS			
Soap	Fatty-acid soap; scouring, fulling	155	*(3b)*
Soap, Nonpareil	Fatty-acid soap; scouring, fulling, washing	140	*(3b)*
Tallow soap	$C_{17}H_{35}CO_2Na$; washing	55	*(2a)*
Sodium acetate, anhydrous	CH_3CO_2Na; dyeing assistant, neutralizing agent buffer	32	URI
Sodium hydrosulfite	$Na_2S_2O_4$; reducing, stripping	22	*(2a)*
Sodium sulfide	Na_2S; reducing dyes	22	*(2a)*
Softener Cream 25%	Sulfonated tallow oil; finishing	39	*(2a)*
Solpinol Special	Pine-oil compound; detergent, wetting agent	70	URI
Soluol	Softener	64	URI
Solvent A	Scouring	25	*(3b)*
Solvent GTS	Pine oil preparation; scouring assistant	41	URI
Solvent T	Washing	25	*(3b)*
Solvex	Washing	1	*(3b)*
Special Textile Flakes	Soap; detergent	112	URI
Starch No 410	Starch; printing inks, size	46	*(2a)*
Strodex	Sulfated amide condensation product; detergent, wetting agent	12	URI
Sulfoxite	$NaHSO_2.HCHO.2H_2O$; stripping, reducing	27	*(2a)*
Supertex E	Fatty acid soaps, solvent and cresylic acid	25	*(3b)*
Synthetic Detergent (Syndet)	Amine condensate; washing, fulling	12	*(3b)*
Syntholite #100	Sulfated secondary alcohol; detergent	10	URI
Syton W-20	Colloidal silica; carding	0	*(3b)*
Tallow	Tallow; soap making	152	*(3b)*
Tragtex R	Gum tragacanth	2	*(2a)*
Triethanolamine	$(HOCH_2CH_2)_3N$; emulsifier, dispersing agent	1; 0	URI; *(6b)*
Triton 770	Alkylarylpolyether sulfate; emulsifying, wetting	9	*(2a)*
Triton 771 Conc	Polyether sulfate; emulsifying, wetting	1	URI
Triton W 30	Arylalkylether sulfate; wetting	50	URI
Ultrawet DS	Sodium alkylarylsulfonate; wetting, detergent	0	*(4a)*
Ultrawet 35K	Sodium alkylarylsulfonate; detergent	0	*(2a)*
Urea	NH_2CONH_2; finishing	9	*(2a)*
Vel	Sulfated monoglyceride of coconut fatty acids	27	*(7)*
Wheat Starch	Starch; printing inks, size	55	*(2a)*
Wool Finish B	High carbohydrates and enzymes; finish	57	*(3b)*
Xylol Scour Special	Detergent	42	URI
Zelan AP Paste	High-molecular nitrogen compounds; durable water repellent	19	URI
Zeset 5	Resin solution; cream-resistant finish	7	URI

URI indicates that these samples were tested at the Sanitary Engineering Laboratory of the Engineering Experiment Station, University of Rhode Island.

* Calculated from the theoretical BOD and the published percent of theoretical.

** The color of the dye interfered with the determination.

† Believed to be low since sample was very old.

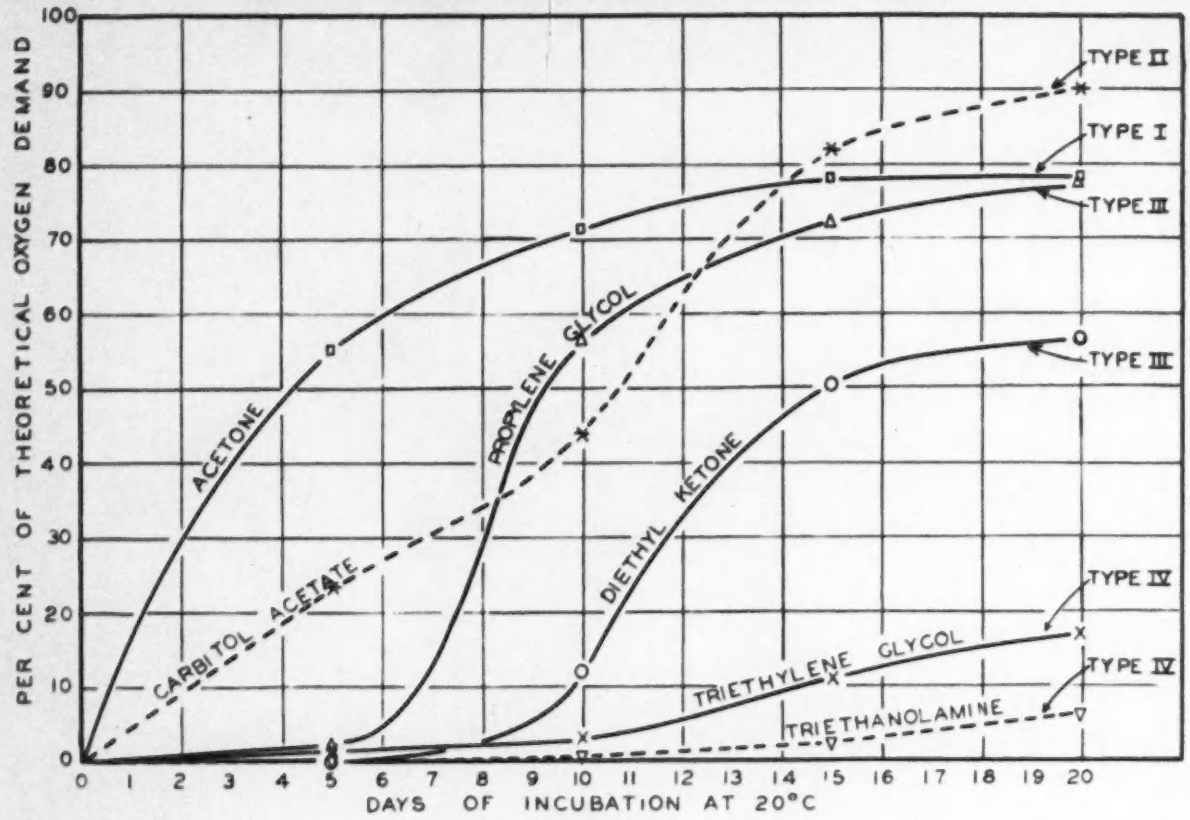


Figure 1

BOD of Synthetic Organic Chemicals Seeded with Sewage

Source of Data: Lamb & Jenkins, *Proc 7th Ind Waste Conf (Purdue 1952)*, p323

periods for the two Type III curves for propylene glycol and diethyl ketone should extend for ten and fifteen days, respectively. Since the two chemicals that give Type IV curves exert only a slight BOD, the results of the 5-day BOD test would not be misleading. Mills and Stack used the 10-day BOD test throughout in their study of the biological oxidation of synthetic organic chemicals *(8)*.

The possibility of eliminating the need for many waste-treatment plants for wool scouring and finishing mills by the substitution of process chemicals low in BOD was recently pointed out *(3a)*. In the cotton textile industry, the pollutional load on treatment plants and streams could be greatly reduced by the substitution of low-BOD compounds for sizing, soap and acetic acid *(2b)*. In general, the use of materials high in BOD, that will eventually be discharged as wastes to streams, should be avoided whenever possible. This is particularly true of process chemicals that are used in large quantities and discharged into comparatively small streams.

SUMMARY AND CONCLUSIONS

1) The 5-day BOD of 64 textile chemicals and dyes was determined.

2) The 5-day BOD of 90 other chemicals was compiled from the literature.

3) Six curves are presented, showing the varying lengths of time for the BOD of various types of chemicals to be exerted.

4) The long-term BOD of substances with low 5-day BOD should be determined to ascertain whether they have a high delayed action oxygen demand.

5) The use of lower-BOD chemicals when possible will greatly relieve stream pollution caused by oxygen depletion during periods of low flow and high temperatures.

6) However, some substances with low BOD may have other objectionable qualities. For example, monochlorobenzene may have other forms of toxicity, and dyes with low BOD may cause objectionable color when discharged into a stream.

7) High BOD *per se* does not mean that a chemical should not be used, since the concentration and total amount discharged should also be considered.

8) The cost and efficiency of a chemical for a particular purpose should be considered as well as its BOD.

9) If large quantities of a low-BOD detergent (or other organic chemical) are discharged into a long river or small lake, cumulative detergent pollution may take place.

ACKNOWLEDGMENT

The Rhode Island Section Subcommittee on Stream Pollution is indebted to Frank J DeLuise and Everett Whitehead for performing BOD tests on samples of textile chemicals and dyes under the direction of Professor Henry Campbell at the Sanitary Engineering Laboratory of the Engineering Experiment Station, University of Rhode Island.

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(6) Lamb, C B and Jenkins, G F, "BOD of Synthetic Organic Chemicals", *Proc 7th Indus Waste Conf, Purdue Univ, Extension Series No. 79*, 326-339 (1952); (a) p326; (b) p328; (c) p334-5; (d) p336; (e) p335.

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Fluorescence——

(Concluded from page P349)

Since any description of the appearance of the treated samples under ultraviolet radiation would of necessity be an arbitrary one, they were photographed under known and reproducible conditions. One photograph, Figure 1, was made with two #2 photoflood lamps as a source of light. A second photograph, Figure 2, was made with only ultraviolet radiation obtained from a Hanovia Quartz Mercury-vapor Analytical Model Ultraviolet Lamp. Screening the lamp was a Corning Filter #5874, which transmitted the ultraviolet radiation while filtering out virtually all of the visible light. Without such filtering, small differences in fluorescence would not have been discernible. A #2A Yellow filter was used over the camera lens. This filter transmits only the visible light reflected and none of the ultraviolet radiations. Such a system of filters insured that any light striking the photographic plate was only that transformed from ultraviolet to visible by the fluorescent characteristics of the sample. The sample was mounted on a nonfluorescent black cardboard background and photographed in a completely darkened room with a thirty-second exposure.

RESULTS——The treated samples were examined under incandescent and ultraviolet lights both visually and with the aid of the camera. The observations are recorded in Table II.

Upon analysis of the results, it is notable that all samples treated in hot aqueous solutions showed a marked decrease in fluorescence. The exceptions to this generalization were the Textone- and peroxide-bleached samples, which definitely increased in fluorescence. Dry heat treatment and mercerization resulted in a similar increase. The fluorescence of the samples which were extracted changed very little; however, the solvent used in the experiment increased in fluorescence. The same phenomenon was observed in the case of the distilled water in which a sample had been boiled but to a much greater extent.

TABLE II

COMPARISON OF TREATED SAMPLES OF COTTON TUBING WITH UNTREATED

Treated Sample #	Under Incandescent Light			Under Ultraviolet Radiation	
	Visually	Photographically	Color of Fluorescence	Visual Intensity	Photographic Intensity
1	same	same	white	very sli less	very sli less
2	same	same	white	very sli less	very sli more
3	same	same	pinkish	apprec less	apprec less
4	same	same	pinkish	apprec less	less
5	same	same	bright white	apprec more	apprec more
6	browner	darker	yellow	apprec more	apprec more
7	same	same	dull pinkish	apprec less	apprec less
8	same	same	white	spotty, apprec more & apprec less	apprec more
9	same	same	pinkish	apprec less	apprec less
10	same	same	pinkish	apprec less	apprec less
11	sli whiter	sli brighter	bluish	less	less
12	much whiter	brighter	purplish	apprec more	less
13	whiter	brighter	white	more	apprec more
14	same	same	dull orange	apprec less	apprec less
15	same	same	light orange	same	more
16	same	same	pinkish	apprec less	apprec less
17	same	same	orange	less	less

SUMMARY AND CONCLUSIONS

The evidence, although obviously inconclusive, suggests strongly that fluorescence depends upon the amount of degraded cellulose associated with the tested samples. Apparently, the materials which contribute to fluorescence are, for the most part, water-soluble as evidenced by the fact that in all samples subjected to treatment in hot aqueous solutions the fluorescence was decreased, with the exception of those processes known to produce some degree of degradation. This is not surprising since degradation is essentially the shortening of molecular chains. With the shortening of the chain length, the molecular weight decreases thereby increasing water solubility. In all probability, both the bleaching agents used in the experiment and the dry heat treatment resulted in some degree of degradation. The fact that the fluorescence of the samples thus degraded was increased supports the assumption that some product or products of degradation are at least in part responsible for the fluorescence of cotton.

Although there is no positive evidence, it seems reasonable to assume that, when degradation reaches a certain point, dyeing characteristics might well be affected. Further experimentation would be necessary to substantiate this supposition.

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New York Section——

THE BAROTOR IN PRACTICAL APPLICATION*

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The principles by which the Barotor dyeing machine is able to advance piece goods in full width through a dyebath under pressure without tension and without creasing have already been explained in previous articles, and also the possibilities of the use of this machine in dyeing fabrics of the newer synthetic fibers. The present author gives a first report on the actual operation of the machine on a commercial basis with full loads of 15 pieces and on the mechanical changes that have been dictated by experience in production to make the machine more practical. He suggests how two or three Barotors should be operated by one crew to make production economical according to modern standards.

INTRODUCTION

ON September 25th, 1952, this section of the AATCC heard a series of papers introducing a new dyeing machine called the Barotor. These papers were presented by Mr Paul Cole, Doctor Raymand Andres, Doctor Paul Meunier and Mr J E Reith, all members of the DuPont Company. They described this new pressure dyeing machine, a commercial model of which had been installed at the Newport Laboratory, and discussed dyes and techniques used in its operation.

Since that time there have been four installations of Barotors at the following plants: Abbeyville of Deering Milliken, Altavista of Burlington, Clarksville of Amerotron, and Waldrich Company. It was realized from the work done at Newport that many phases of dyeing on the Barotor remained to be explored, and the best places to accomplish this exploratory work were in dye plants under day-to-day production conditions.

A very substantial yardage has been processed on these units, and a great deal of information regarding their operation has been accumulated. This paper is a brief accounting of some of this information, and of the Barotor as a practical dyeing unit. The machine is a pressure vessel, wherein it is possible to dye fabrics at full width in a relaxed or tensionless condition at elevated temperatures.

EXPERIMENTAL

The preparation, dyeing and finishing of a piece of fabric always presents a series of problems to the responsible personnel in a finishing mill. The entry of a fabric of new quality to a mill raises many questions. Certain specific requirements as to appearance, shade, hand and life characteristics are known by information supplied by customers or obtained from established performance standards considering its ultimate use. These are the known factors which serve to guide the establishment of processing procedures. Samples of greige goods and of finished cloth are examined. Repeatedly, and, in a majority of cases, it is possible to decide correctly on the proper methods of handling. A whole series of succeeding steps are set up to bring about the desired results. How is this possible? Because there is a great reservoir of accumulated knowledge covering the majority of fabrics made from natural fibers and from the older man-made fibers. Plant managers, superintendents, foremen and technical people have a "know how" and understanding which can be brought to bear on the problems of processing. Added to this group are the people of the dyestuff manufacturers and chemical supply houses, who are always willing to help to the best of their knowledge and ability with the facilities at their command.

When it came to processing fabrics on the Barotor, the situtaion was quite different. There was no storehouse of knowledge accumulated through years of experience and from countless trial-and-error runs. A single piece of equipment had been in use at the Textile Fibers Laboratory in Newport, Delaware, and many dyeings had been made on it. The great majority of these were experimental and on a wide variety of fabrics. While the informattion thus obtained was of great importance and helpful to a degree, it could only serve as a guide, and in many instances these dyeings obviously raised more questions than they answered.

Let us consider several factors that enter into Barotor dyeing. In order to insure good advance of the fabric during dyeing, that is, forward movement to produce levelness, it is imperative that the cloth be slack at all times. It cannot be tight on the bars, or bar marks will appear in the dyed cloth, and it cannot be too slack, or the fabric will get creased and wrinkled. These will show as dark places after dyeing. This all leads to the questions of shrinkage of the fabric during the dyeing at temperatures up to 250°F. The simple answer to this would be to heat-set the fabrics at a temperature sufficiently high to leave little or no residual shrinkage at 250°F. This solution, of course, will take care of all Dacron fabrics and has been set up as standard procedure. However, during the weeks and months of trial runs many fabrics of mixed fiber content were tried, and the methods of preparing them were not so simply arrived at.

After a fabric has been prepared, samples are tested in a pressure cooker to determine the residual shrinkage. If this figure is, say, 3%, one to two percent is added, and the cloth is overloaded to that extent. Good results have been obtained following this procedure.

Many fabrics would appear to lend themselves to preparation on the jig, but the general results have been unsatisfactory because of the variation in shrinkage from piece to piece. A much better result has been obtained by boiling off on the Henniken, frame drying and heat setting where necessary. Other fabrics have been boiled off slack, dried on a loop drier, and short framed. The over-all picture of preparation, shrinkage, loading and dye technique is a very large and extensive one. As most of us know, every type of fabric that can be dyed in the rope cannot be prepared for dyeing by one method and one method only. Nor can they all be dyed in exactly the same way. Conditions must be varied to meet requirements of construction, fiber content and results desired. The Barotor is another type of dyeing machine, and fabric behavior has to be determined. This knowledge cannot be had from dyeing a single sample piece.

MECHANICAL CHANGES —— The original plan for the machine called for a separator bar in each layer of fabric. This bar rode in a channel allowing it to move

* Presented at the Swiss Chalet in Rochelle Park, New Jersey, on Friday evening, Nov 19, 1954.

and drop as the rotor turned and thus advance the fabric. The separator bar has now been eliminated, and the advance is accomplished by the weight of the dye liquor exerting a downward drag on the fabric as the turning rotor raises the material out of the bath. This force can produce as much as twenty to thirty yards advance during the course of a dyeing cycle. This is ample to give level dyeing and to avoid bar marks. The loading of an excessive amount of slack or a large yardage led to another improvement. It was found that, even though the fabric advanced, it could bunch up against an inner bar and exert some pressure on this bar. The ends of the bars ride in slots in the heads of the machine, metal against metal. There was considerable friction between bar end and slot, and the pressure from the fabric would cause the bar to stop revolving, at least for a time, and either to crease the fabric fillingwise or to produce bar marks. Teflon bushings on the ends of the rods corrected this condition and also gave better advance.

There are two methods of loading known as Parallel Loading and Series Loading. Parallel Loading is the original method and necessitates having all pieces of fabric of equal length. This presents definite problems, particularly where working loss is concerned, in producing too many short lengths. Series loading can be the answer to this situation, as, by this method, a continuous length of all the fabric to be dyed may be loaded, regardless of the length of the individual pieces.

To describe both methods of loading in detail this paper would be involved and lengthy. A mimeographed "Barotor Operating Manual" is available, which contains a description of both methods, including diagrams.

Improved spring-type sample holders have been introduced. These work very well and are now standard equipment.

One of the units is equipped with a quick-opening door, which is much handier to work with than the bolt-and-nut type of fastening common on autoclaves of this type.

All of the machines are presently equipped with a pin-and-cam device, which holds the inner bars in place during dyeing. Stainless-steel cables were formerly used for this purpose and may still be employed as insurance to prevent a bar falling out in case the pin mechanism should fail for some reason or other.

Color was originally introduced to the vessel by means of a steam injection system. This presented hazards, especially with dyes that had a tendency to tar. A new gravity feed system works very well and avoids this hazard.

This system employs a gravity feed tank holding fifty gallons and a pressure add tank holding five gallons. The color addition is made by filling the pressure add tank and by then closing the two lines connecting it to the Barotor. When it is filled, the inflow line is shut off, one line to the machine is opened, and then the other line is opened. This causes an equalizing of pressure and a forcing of the liquid in the pressure add tank into the Barotor. A needle valve in a third feed line from the pressure add tank to the machine makes slow and controlled additions possible. Steam to the dyebath must always be shut off during additions. These improvements are all typically evolutionary changes in the development of any new piece of equipment.

DYEING ——— Not only have there been the problems of cloth preparation and behavior but also those of dyestuff behavior and dyeing techniques. As mentioned before, some dyes have a tendency to tar, and these had to be eliminated from formulas being used. There are others which exhibit this tendency and yet work satisfactorily in the machine.

The dyeing of Dacron is usually carried out with selected dispersed colors without any carrier. The selection of these colors is based on their behavior in pressure dyeing as well as on over-all fastness properties. Some work has been done in the use of small amounts of carriers in the laboratory Barotor with encouraging results. The laboratory unit is a small replica of the larger one. It holds a strip of fabric approximately ten inches wide and two and one-half yards long. Formulas developed on this unit show good reproduction on the large machine. Another laboratory machine known as a Tube Dyer is very useful in establishing basic formulas or checking dyestuffs. This apparatus is similar to a Launder-Ometer, having stainless-steel tightly sealed tubes instead of glass jars and an electrically heated oil bath in place of a water bath. This unit is not too useful for cuprous-ion dyeing. Normally the chemicals in this process are added after the color has been added and the temperature has been raised above the boil. Obviously, this cannot be done with sealed tubes. Its main use is for dyeings on all-Dacron fabrics.

Substantial yardages of all-Dacron fabrics have been dyed on the machine, both spun and filament. Quantities of other fabrics have also been processed. As an example, some 20,000 yards of a fabric having a filament-Orlon warp, type 81, and a spun-nylon filling have been successfully dyed. This was all dyed a solid navy by the cuprous-ion method as follows:

The fabric was preshrunk at 220°F by jogging the rotor one revolution at 212°F. Enough of the preshrinking bath was dropped so that, by the addition of cold water, the temperature of the bath was reduced to 130°F. The rotor was turned on and set at 2½ rpm, and 4% Capracyl Blue G was added.

The temperature was raised to 212°F over a 30-minute period. Ten minutes after the temperature had reached 212°F, 2% of acetic acid (80%) was added. The machine was run at this temperature until good exhaustion of the Capracyl dye was obtained (about 30 minutes). Then the following was added:

4% Anthraquinone Blue SWF 150%

0.2% Roracyl Dark Green B

0.6% Pontacyl Fast Red AS Extra

Run 10 minutes and add ¼ of the following solution:

5.0 % copper sulfate

3.0 % HAS

0.25% sulfuric acid

By means of the automatic control, raise the temperature to 250°F. Add one one-fourth portion of the copper-HAS solution at 220°F, one at 250°F, and one 10 minutes later at 250°F. Run 30 minutes and sample. Drop bath. Scour at 160°F for 15 minutes with 2% Sequestrene and 0.01% Duponol RA, both owf. Rinse and unload.

"What is a production load?" and "What is the total dyeing time including loading and unloading?" are the two questions most often asked about the machine. There has been considerable surprise that these figures are not available. The fact of the matter is that in many cases these answers remain to be worked out. We at Waldrich set up initially to handle a top load of ten pieces. When we started a specific type of fabric, we dyed first five pieces, then six, then seven, and so on. This requires a substantial yardage, and, keep in mind, as this experimental yardage is increased, the fabric being handled does not involve thirty-cent-a-yard greige goods. We have dyed fifteen pieces to the load and completed these in less than six hours, including loading and unloading. These are not startling figures, but some of the results could not and cannot be obtained in any other way. Increased loads and shorter handling time will come as improvements are made.

CONCLUSIONS

To theorize, it is conceivable that a Barotor could be built with the drive mechanism permanently attached to the fixed head of the vessel. It would then be possible to employ two rotors, one of which would be Series Loaded while the other was in the machine. This would facilitate the loading and unloading. The economics of the investment would have to be worked out. It is an acknowledged fact that, in any case, one Barotor is not the most desirable set up, anymore than

(Concluded on page P366)

Philadelphia Section——

DYEING "ORLON" ACRYLIC FIBER AND BLENDS WITH OTHER FIBERS*

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E I du Pont de Nemours & Co, Inc
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"Orlon" acrylic fiber, which is noted for a wool-like feel, bulking value, chemical inertness, and resistance toward weathering, molds, and bacteria, may be dyed practically with disperse (acetate) dyes, acid dyes, cationic (basic) dyes, and vat dyes. Selected disperse dyes build up reasonably well at atmospheric pressure to give dyeings of very good light and wash fastness. Selected acid dyes are applicable on "Orlon" in the presence of copper ions to yield dyeings of good depth at atmospheric pressure, but better exhaustion and a greater selection of colors are obtained under pressure. Cationic (basic) dyes color "Orlon" readily at the boil to give dyeings of very good wet fastness. Although the light fastness of the old-fashioned basic dyes on "Orlon" is not especially good, newer types like the "Sevrons" give quite good light fastness. Of special interest for the application of cationic dyes is a new method for calculating if the affinity of the "Orlon" is sufficient to take up the amount of dye desired for a particular shade.

Selected vat dyestuffs of various types can be applied on "Orlon" in full shades under pressure without damage to the fiber by a method explained here to obtain shades of excellent fastness to light and washing.

After explaining how "Orlon" alone is dyed, the authors show how special procedures are employed to color blends of "Orlon" with wool, rayon, cotton, nylon, and "Dacron" polyester fiber.

INTRODUCTION

SINCE the formal introduction of "Orlon" acrylic fiber a number of years ago much progress has been made in the coloration of this fiber. It would be safe to say that this fiber received more immediate attention than any other and its dyeing problems were solved in the shortest time. Its ready acceptance for many end uses hastened the fruition of the many types of dyeing and printing procedures. Its use in blends presented dyeing problems which, though initially difficult, have been satisfactorily solved. The blends have proven a panacea whereby unique designs and patterns such as tone-on-tone and contrasting shades can be simply achieved by the use of a blend fabric. Recent developments with the high-bulk yarn are extending the uses of "Orlon" further.

The dye chemist, the application chemist, the mill technician, and the fiber-and-fabric-development technologist have succeeded masterfully in giving us a very complete and comprehensive story for "Orlon." The major problems have been solved. New developments will be forthcoming.

Our recommended procedures are reviewed and new ones presented. Information on new colors being introduced for this fiber is given. All comments refer to Type 42 unless otherwise stated.

DYEING "ORLON" ALONE

"Orlon" can be dyed *(1)* with many classes of dyes. This is a definite advantage since this latitude of application for blends is especially desirable. Disperse dyes in pale shades have surprisingly good light fastness and good washing fastness. Acid or anionic dyes, applied with use of the cuprous ion, give a spectrum of shades with good to excellent light fastness and good wet fastness. Cationic or basic colors give brilliant shades with good to excellent light fastness and good to excellent washing fastness, with the latter, in many cases, comparable to the best fastness of vat dyes on cotton. Vat dyes give good to excellent light fastness and excellent wet fastness. Each class has its uses and these will be discussed in subsequent sections.

DISPERSE DYES———Disperse dyes are applied only in pale shades in the presence of a dispersing agent, such as "Duponol" RA surface-active agent, at the boil to give good light and good washing fastness. Dyeing at 225°F does not increase their strength appreciably over application at 212°F. The levelness obtained is excellent. Table I lists three colors and their light-fastness ratings.

In a tan shade the colors of Table I give a 4-5 light rating.

ACID DYES———Applied by the cuprous-ion method, acid dyes are desirable for many end uses. Since reducing conditions are necessary, they are applied most economically in closed equipment. Rawstock and yarn are especially suitable for dyeing with this class of colors.

The cuprous ion is generated from the cupric ion by means of reducing agents: hydroxylammonium sulfate at the boil, sodium bisulfite alone or combined with glyoxal above 212°F. Redox-potential control is desirable in establishing initial formulations or for trouble shooting. Most of the difficulties inherent in dyeing with acid colors are the result of 1) loss of reducing condition by aeration, 2) loss of sulfur dioxide during the use of bisulfite, 3) poor circulation in the machine, or 4) improper loading. Introduction into the fiber of the large amounts of cuprous ion necessary for deep shades results in shrinkage and compaction of the fiber, and thus impedes circulation. The hot-wet loading technique is a practical means of obtaining circulation of dye liquor through the fiber mass.

Good to excellent light fastness is obtainable with this class of colors. A list of a number of dyes with their ratings appears in Table II.

In dyeing the "Roracyl" Navy Blue N and "Roracyl" Black N in circulating machines the following procedure is recommended:

12.0% "Roracyl" Black N
3.0% sodium bisulfite
12.0% copper sulfate
0.5% sodium nitrate

TABLE I

LIGHT FASTNESS OF DISPERSE DYES ON TYPE 42 "ORLON" ACRYLIC STAPLE

			Fade-Ometer Rating
Maize	0.15%	"Latyl" Yellow YL	6
Baby Pink	0.05%	"Celanthrene" Cerise B	6
Baby Blue	0.05%	"Celanthrene" Brilliant Blue FFS Conc 200%	6

* Presented by J F Laucius at Kugler's Restaurant in Philadelphia on Friday evening, Dec 3, 1954.

With 6% "Roracyl" Navy Blue N, 1.5% sodium bisulfite and 6.0% copper sulfate are used.

1) Dissolve dye in kier half-filled with boiling water.

2) Load rawstock into hot dye liquor, place cover in position, add sufficient water to circulate liquor and set temperature at 170°F.

3) Add sodium bisulfite previously dissolved in cold water.

4) Add copper sulfate and sodium nitrate, dissolved in hot water, over a 5-minute period. Circulate approximately 3 to 5 minutes and pressurize the system.

5) Raise the temperature to 220°F at two degrees per minute, hold for 10 minutes and raise to 230°F at one degree per minute.

6) Dye one hour at 230°F, cool, rinse, scour at 180°F with 0.5% "Duponol" RA surface-active agent. Finish as desired.

For shading Du Pont Orange RO, "Pontacyl" Violet 6R Conc 150% and Du Pont Anthraquinone Green G are recommended.

In dyeing top by the cuprous-ion method it is imperative that adequate mechanical means be used to reduce the liquor pressure.

Acid dyes are economical for many shades. However, their use becomes less attractive with the development of new cationic dyes in view of the ease of application of cationic as well as disperse dyes.

CATIONIC DYES——One might question the terminology. We propose that the term "cationic dyes" be used for those dyes which have a colored cationic ion associated with some colorless anion. Essentially all of the classical basic dyes fall under this classification, but a few, such as Chrysoidine and Bismarck Brown which dye "Orlon" as disperse dyes, do not. The cationic colors dye by salt formation.

The popularity of this class of dyes is manifest. They dye "Orlon" direct to give dyeings with good to excellent wet fastness and good light fastness with newly developed colors and a number of old ones. Scouring before dyeing should be done with "Capracyl" Leveling Salt; ammonia should *not* be used. The cationic dyes can be applied with "Capracyl" Leveling Salt, a small amount of sodium acetate and generally with acetic acid. With some of the new dyes which we shall talk about no acid is necessary; in other words, dyeing under neutral or slightly alkaline conditions is possible. In dyeing light to medium shades, the use of Retarder LAN is recommended to obtain level dyeings: for light shades 3 to 5% and for medium shades 1 to 2%. In the dyeing of deep shades it is not necessary. The temperature should be 210 to 225°F.

TABLE II

LEVEL DYEING ACID COLORS FOR "ORLON" TYPE 42 ACRYLIC FIBER

Dye (2%)	*Light Fastness Fade-Ometer Rating*
Du Pont Quinoline Yellow PN	5-6
Du Pont Neutral Brown BGL	8
Du Pont Resorcin Brown 5G Conc 200%	6-7
Du Pont Crocein Scarlet N Extra	5
* Du Pont Milling Red 8WB Conc 125%	5
"Pontacyl" Violet 6R Conc 150%	5
Du Pont Anthraquinone Blue RXO	7
Du Pont Anthraquinone Green G	6-7
* "Roracyl" Navy Blue N (6%)	7-8
* "Roracyl" Black N (12%)	8

The following dyes were available a short time ago:

"Sevron" Yellow L (formerly Du Pont Basic Yellow OL)
"Sevron" Brilliant Red 4G (Du Pont Basic Red 4G)
"Sevron" Blue B (Du Pont Basic Blue OB)
Du Pont Victoria Green Small Crystals
Du Pont Brilliant Green Crystals
Du Pont Fuchsine Conc
"Lithosol" Blue G
"Lithosol" Blue 6G
Du Pont Leather Basic Blue R

The first three dyes give good light fastness, while the two greens and Fuchsine are useful in navy and black formulations and for shading. The latter blues, "Lithosol" Blue G and Blue 6G, are useful for bright shades, but they give only moderate light fastness. The Leather Blue R, which gives fairly good light fastness, is useful in dyeing 100% "Orlon" but not in dyeing blends of wool and "Orlon" because of excessive wool staining.

To the above list the following dyes have been added recently:

"Sevron" Yellow R
"Sevron" Blue 2G
"Sevron" Green B
"Sevron" Orange L
"Sevron" Red L

The "Sevron" Yellow R is redder than the "Sevron" Yellow L and is especially useful in making black formulations because of its tinctorial power. It is very lightfast. The "Sevron" Blue 2G is also very lightfast and is a companion color to the "Sevron" Blue B; it is very useful for men's suiting fastness in light shades. The "Sevron" Green B is faster than Du Pont Victoria Green and Du Pont Brilliant Green in light fastness and is useful in shading dark-brown shades.

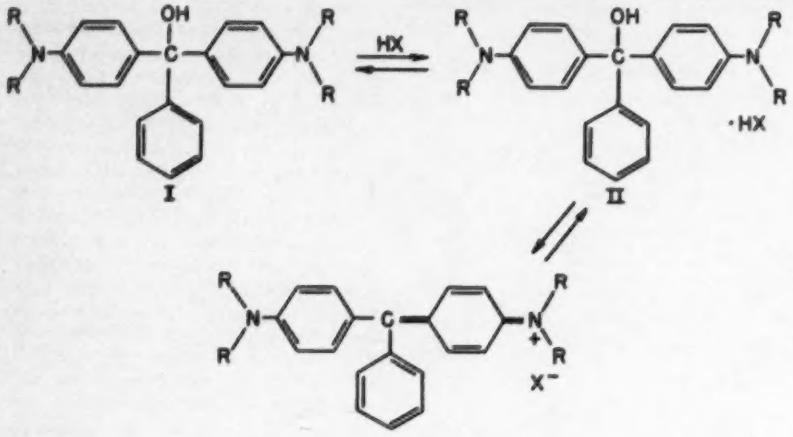
The "Sevron" Orange L and "Sevron" Red L are especially useful, since they are lightfast and can be used to improve light fastness and thus to meet the requirements for many shades of men's suiting. Moreover, these colors can be applied neutral and together with colors stable to neutral dyeing conditions, like "Sevron" Blue B and "Sevron" Blue 2G, many useful shades can be made under these conditions. There is one word of caution with these dyes: dyeings should not be carried out below a pH of 5, otherwise a prototopic shade change is encountered. In dyeing light and medium shades 4% Du Pont Retarder LAN *must be used* with these colors. If one must check a neutral shade, it is advisable to treat a sample swatch of the dyeing with dilute ammonia at 180°F. If there is a shade change, too much acid or too low a pH is being used in the dyebath.

"Sevron" Yellow R, "Sevron" Yellow L, "Sevron" Green B, as well as Du Pont Brilliant Green and Du Pont Victoria Green, are not hydrolytically stable at the boil at a pH above 6. Some difficulty is experienced occasionally with Du Pont Brilliant Green and Du Pont Victoria Green. After dyeing, the fiber is normally rinsed, generally with water until no color is left in the dyebath. Whereas the wet fiber shows no mark-off on rubbing, subsequently in hot moist pressing or drying, loose color appears. This has been ascribed to sublimation. Actually, cationic dyes properly applied do not sublime. This phenomenon can be explained by use of the reactions *(2)* indicated in Figure 1.

Structure I is colorless, while the addition of acid (HX) gives Structure II, which is also colorless until heated to give Structure III, which is green. If alkali is added, Structure III reverts finally to Structure I (colorless). If loose surface color on "Orlon" or its blends is present during rinsing with cold water, colorless Structure II is obtained. Subsequent heating or moist pressing causes the regeneration of Structure III (green) and gives the impression of sublimation. If loose color is present and alkali is added, colorless Structure I is obtained, which form can decompose more or less; later acidification and heating regenerate the green Structure III.

If staining or loose color is evident, the use of 1 to 2% "Sulfoxite" C dye-stripping agent and 0.5 to 1% acetic acid for 20 minutes at 180°F will do the best surface stripping. Do not use ammonia or alkali, which decompose some colors and decolorize the rest. At an acid pH, the color is visible; thus one sees the stripping action. If one merely decolorizes with an alkali, difficulty may result with the reappearance of color in subsequent use.

"Orlon" has a limit to the amount of cationic dye which can be absorbed. We have derived a simple expression to determine whether we are using too much dye or, better, to explain why we get "block-



I II III

Figure 1

ing." Given a dye formula and performing the indicated arithmetic we get a value K. If this number is greater than about 1.8, we cannot completely exhaust this formulation onto the fiber. The approximate factor values for each dye are given in Table III.

In practice, each percentage of a color component is divided by the above divisor factor to get a value A. These A values are all added together to give the value K. Again, if this value is above 1.8, excess color is being used. Table IV lists an example for calculating the K value of a dye formula.

In some cases a K above 1.8 is used to increase the rate of dyeing. The excess will either stain the fiber or remain in the dyebath. If staining is evident, the above stripping procedure is recommended.

The stripping of basic dyes can be attained by the use of sodium or calcium hypochlorite or sodium chlorite and nitric acid at the boil, followed by antichlor treatment with sodium bisulfite.

A good black is possible by use of "Sevron" Yellow R, Victoria Green and Fuchsine. The formula is as follows:

0.58% Du Pont Victoria Green Small Crystals
0.42% Du Pont Fuchsine Conc
0.10% Du Pont Brilliant Green Crystals
2.75% "Sevron" Yellow R

A bloomier black can be obtained by use of "Sevron" Orange L.

1.4 % "Sevron" Yellow R
1.65% "Sevron" Orange L
0.36% Du Pont Fuchsine Conc
0.8 % Du Pont Victoria Green Small Crystals

Where a black is used in dyeing an "Orlon" blend with wool and cellulosic fibers, the substitution of "Sevron" Brilliant Red 4G for Fuchsine will minimize the staining of wool.

A number of suiting shades with numerical ratings for light fastness are given:

TABLE III

FACTOR VALUES

Color	*Divisor*
"Sevron" Yellow L	4
"Sevron" Yellow R	3
"Sevron" Orange L	2.5
"Sevron" Brilliant Red 4G	4
"Sevron" Red L	2.5
Du Pont Fuchsine Conc	1
"Sevron" Blue B	4
"Lithosol" Blue G	1
"Sevron" Blue 2G	4
"Lithosol" Blue 6G	1
"Sevron" Green B	4
Du Pont Brilliant Green Crystals	1
Du Pont Victoria Green Small Crystals	1

Tan *LF, 4-5*
0.32% "Sevron" Orange L
0.01% "Sevron" Red L
0.20% "Sevron" Blue B
0.20% "Sevron" Blue 2G

The light fastness of this tan is better than that of the previous recommendation. If this light-exposed fabric is subjected to an AATCC Wash Test #3, no fading is evident. An exposure to 80 hours in the Fade-Ometer followed by a Wash Test #3 shows only a trace of fading.

Gray *LF, 5-6*
0.12 % "Sevron" Orange L
0.048% "Sevron" Red L
0.72 % "Sevron" Blue 2G

TABLE V

VAT DYES FOR "ORLON"

* "Ponsol" Golden Yellow GK Double Paste
"Sulfanthrene" Brown G Paste
"Sulfanthrene" Pink FF Paste
"Sulfanthrene" Red 3B Paste
"Sulfanthrene" Red Violet 2RN Paste
"Sulfanthrene" Blue GR Paste
"Sulfanthrene" Blue 2B Double Paste
* "Ponsol" Blue Green Y Double Paste
"Ponsol" Jade Green Double Paste
* Du Pont Fast Black NCL

* Have much better affinity at 225°F.

This gray gives men's suiting fastness.

Brown *LF, 7*
1.0 % "Sevron" Orange L
0.48% "Sevron" Red L
1.8 % "Sevron" Blue 2G

This light fastness is adequate for men's suiting.

VAT DYES——Selected vat dyes of the indigoid, thioindigoid and anthraquinone type have good affinity for "Orlon." Their application to yarn and rawstock is practical, and their use for shades that are fast to cross dyeing is recommended. Semimill-scale dyeings of black, navy, green, gray, and blue shades have demonstrated the feasibility of the dyeing process and have confirmed the excellent fastness properties possible. The vat dyes in Table V are applicable at atmospheric pressure on "Orlon," although deeper shades are obtained with all of them at 225°F, and those with an asterisk have much better affinity at that temperature.

"Ponsol" Jade Green Double Paste builds up to medium shades only, showing no improvement when applied at high temperature. However, it may be useful in some cases as a shading component in place of the yellow.

The light fastness of these vat dyeings is good to excellent (80-320 hours) with the exception of that of "Ponsol" Golden Yellow GK, which has about 20-40 hours' fastness. Dyeings are fast to cross dyeing and acid crabbing.

Damage to the fiber by alkaline hydrolysis can be avoided by maintaining a pH of 10 and using a combination of sodium carbonate and sodium sulfite with "Sulfoxite" C as the reducing agent. The dyes are reduced with the above chemicals in a comparatively low volume in the

TABLE IV

K VALUE CALCULATION

Formula	*%*	*Divisor*		*A*
"Sevron" Yellow R	2.1	3	=	0.7
"Sevron" Orange L	0.25	2.5	=	0.1
Du Pont Fuchsine Conc	0.4	1	=	0.4
Du Pont Brilliant Green Crystals	0.5	1	=	0.5
		K	=	1.7

expansion tank at 200 to 210°F, and then are released to the kier. The temperature is gradually increased to 225°F, and dyeing is continued for one hour. After being rinsed with water, the dyeing is oxidized with "Albone" 35 hydrogen peroxide and acetic acid.

The following general procedure is used; percentages are based on the weight of "Orlon":

1) The kier is half-filled with water and heated to 200 to 210°F, and the stock is loaded as evenly as possible. The cover is placed in position, the machine is filled with water, and the temperature is again raised to 200°F.

2) Approximately one-fourth of the total amount of sodium carbonate and "Sulfoxite" C reducing agent used in dyeing is added to the expansion tank and then circulated through the kier.

3) The expansion tank is closed off from the kier, and a solution of the remainder of the sodium carbonate and "Sulfoxite" C as well as the sodium sulfite is added. Vat dyes previously pasted with 2.0% of Compound 8-S and diluted with water are then added to the expansion tank.

4) The vat dyes are reduced by raising the temperature close to the boil for 10 to 15 minutes.

5) The reduced dye solution is then released to the kier and circulated at 200°F for 10 minutes.

6) Machine is pressurized and temperature raised to 225°F over a 20-minute period and held for one hour.

7) The bath is cooled and dropped, and the rawstock rinsed clear with water.

8) The dyeings are oxidized with 10.0% "Albone" 35 hydrogen peroxide at 210°F for 30 minutes in a bath containing 5.0% acetic acid (56.0%) and 0.5% "Duponol" RA surface-active agent. The stock is rinsed, aftertreated, centrifuged and dried.

A typical formula is as follows:

Bright Blue Shade

%
17.5 "Sulfanthrene" Blue 2B Double Paste
12.0 sodium carbonate
10.0 "Sulfoxite" C reducing agent
10.0 sodium sulfite
2.0 Compound #8-S

Du Pont Fast Black NCL has so far been the most suitable vat black tested for dyeing "Orlon" Type 42. A 15-minute pretreatment of the fiber at or near the boil with 10.0% of beta naphthol (technical) has been beneficial in producing a more bloomy and deeper black. Du Pont Fast Black NCL is also suitable as a base for a gray shade and as a dulling component for navy and brown shades.

The following are color selections for various shades:

Navy Shade

%
7.0 "Sulfanthrene" Blue GR Pst
14.0 "Sulfanthrene" Blue 2B Dbl Pst
4.0 Du Pont Fast Black NCL

Brown Shade

%
10.0 "Sulfanthrene" Brown G Pst
4.0 Du Pont Fast Black NCL

Gray Shade

%
2.0 Du Pont Fast Black NCL
0.8 "Ponsol" Jade Green Dbl Pst

Black Shade

%
24.0 Du Pont Fast Black NCL
5.0 "Sulfanthrene" Blue 2B Dbl Pst

DYEING BLENDS CONTAINING "ORLON"

"ORLON" IN BLENDS WITH WOOL ———We have published extensively on the coloration of blends of "Orlon" and wool*(1)*. Cationic dyes are used on the "Orlon" and acid dyes on the wool. Scouring with "Capracyl" Leveling Salt is recommended; do not use ammonia. The use of "Capracyl" Leveling Salt, sodium acetate and acetic acid in the dyebath is recommended.

In using neutral-dyeing acid colors, the acid color is applied first, followed by the addition of cationic color at 200°F and dyeing at the boil. Prolonged boiling will cause transfer of the stain of the cationic color on the wool to the "Orlon." In dyeing light shades with Retarder LAN a two-bath procedure is used. The basic dyes are applied first, followed by a dyeing of the wool conventionally in a second bath. Scouring with "Capracyl" Leveling Salt and acetic acid is recommended.

Where the "Orlon" is dyed and wool is undyed, the "Orlon" is dyed conventionally. If wool staining is evident, the stain can be removed by a scour with "Sulfoxite" S and acetic acid.

In cross-dyeing contrasting shades on the wool and "Orlon" no staining of the wool by the cationic dyes can be tolerated. Light and medium shades on "Orlon" are dyed as indicated above for dyeing solid unions. For deep shades, such as navy and black and brown, it is advisable to dye the "Orlon" first and then to strip the wool stain. The wool is then dyed at the boil.

In dyeing blends in a one-bath operation one must satisfy himself that the acid dye and cationic dye will not precipitate. Color selections are available where one-bath operation is possible. For example, with a 50:50 blend of wool and "Orlon" the following contrasting combination may be dyed to obtain bright shades on the wool and the "Orlon":

%
1.0 "Chromacyl" Brilliant Pink 3B
1.0 "Sevron" Blue 2G
1.0 sulfuric acid
2.0 "Capracyl" Leveling Salt

The "Chromacyl" dye with the acid and "Capracyl" Leveling Salt is added at 120-140°F, and the temperature is raised to 180-190°F. The cationic dye is then added, the temperature is raised to the boil, and the dyeing is carried out for 1 to 1.5 hours. The fabric is then rinsed and scoured in the usual way with 0.5% "Capracyl" Leveling Salt.

The use of a high concentration of sulfuric acid is not advocated in dyeing "Orlon" because of its prototropic effect on many cationic dyes. While 1% sulfuric acid on the blend would probably be insufficient to give adequate levelness of the "Chromacyl" dye on wool, it does appear suitable for blends with "Orlon." The "Sevron" Blue 2G will not tolerate higher concentrations of acid.

"ORLON" IN BLENDS WITH RAYON OR COTTON———For dyeing light shades, disperse dyes for the "Orlon" and direct colors for the cellulosic fibers are applied by a one-bath procedure.

In dyeing medium and heavy shades one- or two-bath procedures are available. If the cationic dye is stable to neutral or slightly alkaline conditions, a one-bath procedure is indicated. The useful cationic colors are "Sevron" Orange L, "Sevron" Red L, "Sevron" Blue B, and "Sevron" Blue 2G. "Sevron" Brilliant Red 4G is also useful in neutral dyebaths. With these dyes many secondary and tertiary gray, tan, and brown shades are possible. Large amounts of "Capracyl" Leveling Salt are not recommended under these conditions since it exhibits a desorbing effect on the direct dyes. Dye fixatives can be applied from an aqueous bath. On rayon, in light bright shades with urea-formaldehyde resin (for stabilization of the cellulosic fiber), large amounts of copper should be avoided as well as high temperatures of curing. The copper ion will dull the shade of the "Orlon" fiber and, of course, rayon in bright shades, such as yellow and orange. By the use of proper conditions, little to no effect on the shade or fastness of dyes for the "Orlon" by the resin and dye fixative is evident.

Where high washability is necessary, the "Orlon" is dyed first with cationic dyes followed by application of vat dyes for the rayon by conventional means. In pad-steam dyeing of the cellulosic fibers little or no staining of the "Orlon" is evident with many vat dyes.

BLENDS OF "ORLON" AND NYLON ———In general, the procedures used for dyeing blends of wool and "Orlon" with cationic dyes are employed for the "Orlon", and the nylon is dyed with acid dyes. If the nylon is stained, the stripping procedure given above is recommended.

BLENDS OF "ORLON" AND "DACRON" POLYESTER FIBER ——— The

"Dacron" is dyed first with disperse dyes in the presence of "Dowicide" A as a carrier, followed by a scour with "Duponol" RA at 180-200°F. The "Orlon" is tinted in this process. The "Orlon" is then dyed with cationic dyes. Some cationic dyes may stain the dyed "Dacron" slightly. The usual rinse and scour are given.

DYEING "ORLON" TYPE 81——This fiber dyes with disperse, cationic, acid and vat dyes, generally at 250°F, acid and cationic dyes being principally recommended. A good shade range having excellent wet fastness is obtainable. A considerable amount of yarn dyeing has been done. The use of pressure-dyeing machinery, such as the Barotor and the Burlington Engineering Co pressure-dyeing machine, has increased the usefulness of this fiber in piece dyeing. The dyeing procedures are comparable with those for "Orlon" Type 42 except more copper is necessary for the acid dyes and a longer time of dyeing even at higher temperatures.

"Orlon" Type 81 dyed with basic dyes for two or three hours at 250°F is especially useful for fancy-colored effects since Type 81 is very resistant to dyeing under conventional conditions with the colors usually applied to the other fibers.

ACKNOWLEDGMENT

The material presented has been developed as a result of the co-operative effort of the Organic Chemicals Department and the Textile Fibers Department of E I Du Pont de Nemours & Co, Inc. The following have contributed materially to the above information: Messrs L Bidgood, P A Cook, D E Gamble, G T Hug, J R Nisbet, and R J Thomas.

The registered trade-marks ORLON, DACRON, CAPRACYL, CELANTHRENE, ALBONE, CHROMACYL, DUPONOL, LATYL, LITHOSOL, PONSOL, PONTACYL, RORACYL, SULFANTHRENE, SULFOXITE and the trade-mark SEVRON appearing in the above article are the property of E I du Pont de Nemours & Co, Inc.

REFERENCES

(1) Meunier, P L, Laucius, J F, Brooks, J A, and Thomas, R J, *Am Dyestuff Reptr* 42, P470 (1953); Laucius, J F, *ibid* 42, P792 (1953); Laucius, J F, and Meunier, P L, International Congress of Man-Made Fibers, June 1, 1954. Paris.

(2) Whitmore, F C, "Organic Chemistry", 2nd Ed, p725. D Van Nostrand Co, Inc (1951).

Barotor——

(Concluded from page P361)

one jig is a sound investment. The Barotor requires two men to operate it, but these same two men could possibly operate two units and three men might operate three machines. How this question of the number of men required to operate more than one machine will resolve itself, will be very interesting to watch, as more units are installed.

The machine has proven very functional. When all factors are right, the performance has been excellent. It is knowledge and control of these factors that have to be built up. Additional mechanical improvements will come, and the machine will assume a very necessary place in the dyeing industry.

DISCUSSION

Question: What advances in technique have you worked out to obviate variation in color and variation in hand from lot to lot?

Answer: Control of color is still somewhat of a problem, but, with increased knowledge of the factors influencing dyeing, progress in getting uniformity of shade from lot to lot is being made.

Variations in hand hardly occur on the Barotor for a given color and type of fabric. Any variation in hand is due to variations in finishing or in preparation before dyeing.

Q: What about the variation in hand from color to color?

A: Obviously, a very dark shade produced by the cuprous-ion method does not have the same hand as a light shade produced under pressure.

Q: Just what advantages does the Barotor give you over conventional machines?

A: Well, with respect to Dacron fabrics, I would say that better appearance and better general quality of fabric are obtained on a Barotor. Further, all-Dacron fabric dyed on the Barotor displays less warpiness.

As for a comparison of economics, that remains a question that can be answered only after we have thoroughly demonstrated that the machine is practical.

Q: Could you not accomplish the same thing with a conventional pressurized machine?

A: Possibly.

Q: Then why invest in a Barotor?

A: I do not believe you can duplicate the work of the Barotor by the use of pressurized jigs or boxes. You cannot dye all-spun-Dacron suitings on a pressure jig. We are doing the best job for such a fabric on a Barotor. We have also had excellent results in dyeing Orlon 81 fabrics. Again there was no warpiness on these fabrics. You couldn't dye this taffeta in rope form, but you might try to dye it on a pressurized jig. If a taffeta is full of lines, the Barotor will not eliminate them, but it does seem to take care of warpiness. In the case of Dacron, it certainly helps greatly in eliminating warping.

Q: What about other dyes than disperse (acetate) types, which you have emphasized mostly?

A: We used other types on Orlon using the cuprous-ion method. As yet we have not dyed any 100% nylon.

Q: Have you tried vat colors?

A: The idea of applying vat colors under pressure free from oxygen has appealed to us, but the technique has not been worked out. Other more readily soluble problems have kept us from such experimentation.

Q: Have you compared the results in the Barotor with results in the Burlington machine?

A: No, but one concern that has dyed a considerable amount of Orlon on the Burlington and that has also had work done on the Barotor has told me that the fastness properties of the Barotor-dyed Orlon were a bit better. The results on both, however, were satisfactory.

Q: Was the Burlington open or closed?

A: It was closed and was operated at 10 pounds' pressure.

Q: Was the somewhat better fastness due to greater pressure in the Barotor?

A: Possibly, that is, there was probably better penetration of color.

Q: Were sheer fabrics dyed on the Burlington?

A: These were knitted goods.

Q: Was there acetic acid in the bath in the Barotor in dyeing Dacron?

A: Yes.

Q: What is the purpose of the acetic acid?

A: To insure stabilization of the acetate colors at the high temperatures.

NEW YORK SECTION MEETING

(See report of meeting on page P313 of previous issue)

April 22, 1955 — **Kohler's Swiss Chalet, Rochelle Park, N J**

(L to r): Edmund A Leonard, Alexander Smith Inc, vice chairman; John H Hennessey, Berkshire Color & Chemical Co, chairman; Reiner G Stoll, Fred Fortess (speaker), Ruth Walker, and Victor S Salvin, Celanese Corp of America; Donald E Marnon, American Aniline Products, Inc, technical program chairman.

HEAD TABLE (l to r): Raymond J Carey, General Dyestuff Co; Matthew J Babey, American Cyanamid Co, councilor; Edmund A Leonard; John H Hennessey; Fred Fortess; Donald E Marnon; Patrick J Kennedy, E I du Pont de Nemours & Co, Inc, councilor; George L Baxter, Bradford Dyeing Assoc, AATCC vice president.

A general view of the audience at the meeting.

JOINT MEETING — NORTHERN NEW ENGLAND SECTION
LOWELL TECHNOLOGICAL INSTITUTE STUDENT CHAPTER

April 22, 1955 — **Lowell Technological Institute, Lowell, Mass**

(L to r): Frank J O'Neil, Pacific Mills; Prof J H Skinkle, executive director, LTI Research Foundation; John M Gould, Barre Wool Combing Co, Ltd, NNE Section chairman; Nancy J Geary, Piet Bodenhorst, Alan A Denio (forum moderator), and John L Twarog, panelists at the afternoon forum on "The Effect of Dye Structure on Dyeing Properties".

(L to r): Robert G Adell; Prof John J McDonald, head of the department of textile finishing at LTI; John M Gould, NNE Section chairman, saluting Chester J Petkiewicz, chairman of the LTI Student Chapter; Harold C Chapin, AATCC secretary; Prof Emeritus Elmer E Fickett; and Thomas G Garvey, LTI graduate student, one of the evening's speakers.

(L to r): John W Gates, Charles P Riley and Andre J Pelletier, LTI graduate students who presented papers; John P Ploubides, Pacific Mills, NNE Councilor; Vincent McKone, LTI '55, chairman of the evening program; and Frank J Rizzo, Quartermaster Research and Development Command, Natick, Mass.

(L to r): John J Scaringi and Piet B Bodenhorst, LTI students; Roland E Derby, Jr, The Derby Co, Inc; Frank J O'Neil, Pacific Mills; Alfred J Carbone, Sandox Chemical Works, Inc; Prof R J Peirant, LTI department of chemistry.

WESTERN NEW ENGLAND SECTION MEETING

March 18, 1955 — **Rapp's Restaurant, Shelton, Conn**

(Photos by A N Henschel)

James B Mumma, Carbide & Carbon Chemicals Co, is shown (top row, center) delivering his talk "Theory and Practice in the Use of Synthetic Textile Lubricants"

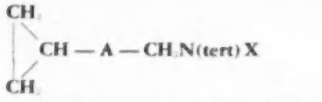
• PATENT DIGEST •

PAUL WENGRAF

WATER REPELLENT——— Cyclopropyl-Quarternary Ammonium Compounds G2,02

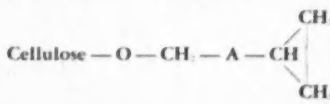
USPat 2,680,057
(Deering Milliken Research Trust——— Janes———June 1, 1954)

Standard water-repellent agents of the Zelane (Velan) type, which apparently react with the textile molecules, have *one reactive functional group only*. In contrast the process outlined in the current patent operates with compounds having *two unlike functional groups*, both of which react with the molecule of the fiber. One of them is the quaternary ammonium group as used in Zelane and similar methods; the other is a cyclopropane group. These compounds have the following general formula:



wherein "A" generally is a hydrocarbon chain (not over 30 C) attached to the remaining complex by ether, imino, urea, or other linkages.

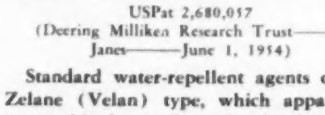
The cyclopropyl compounds may be produced by several methods common in organic synthesis, eg, by reducing the corresponding dibromo alkane with Na or Zn. Above 100°C tertiary amine is liberated (similar to that which occurs in the Zelane reaction), giving the following:



but the free radical will further decompose if the cyclopropane ring opens and reacts with another cellulose molecule to form cross-linkages of the type

These compounds are easily hydrolized by heating them to temperatures in excess of 80°C in the presence of moisture. Therefore, the impregnated textiles must be predried at low tempertaures and baked. The pH of the treated and cured material (calculated by extracting with water for one-half hour) is preferably 6-7. Durable water repellency, softness, dimensional stability and crease resistance are said to be imparted.

Example: Pyridinium chloride is reacted with para-formaldehyde and cyclopropionyl urea (from urea and cyclopropionic acid) until a test sample gives a clear solution in warm water. The compound has the formula



Cotton cloth which is impregnated with a 5% aqueous solution, squeezed to a pick-up of 100%, dried at 60° C, baked initially at 90° C for 5 min, and then for 20 min at higher temperatures (not over 145° C) becomes durably water repellent, dimensionally stable and crease resistant.

It should be noted that the cross-linking effect occurs not only in natural or regenerated cellulosic fibers, but also in protein fibers, probably because of chemical reaction with the NH groups. The method can also be applied to man-made (synthetic) fibers.

Among the references cited by the Patent Office:

USPat 2,209,383 (Rohm & Haas/1940): hydrophobing cellulosic textiles by a treatment with an aqueous solution of a high, substituted quaternary ammonium compound, followed by decomposition in baking.

USPat 2,189,664 (Emulsol Corp/1940): substituting higher fatty acid-alkoxy amino groups for surface-active agents of the quaternary ammonium type.

USPat 2,146,392 (Imperial Chemical Industries/1939): preparing quaternary ammonium compounds by reacting a salt of pyridine, its homologs or quinoline with formaldehyde and a higher acid amide. (This belongs to the series of "Velan" patents.)

USPat 2,125,901 (Imperial Chemical Industries/1938): improving the fastness of starch finishes on textiles by incorporating a high, substituted pyridinium compound of the Velan type.

Brit Pat 547,846 (Cilander A G/1942): applying aldehydes ("sthenosage") and esterifying or etherifying agents of the Velan type to cellulosic textiles.

DYEING POLYAMIDE FIBERS WITH CHROMIUM COMPLEX AZODYES———Ethylene Oxide Condensates Added C,4,07

Brit Pat 701,192
(Badische Anilin- & Sodafabrik———Dec 16, 1953)

Shaped material of linear polyamides, especially fibers such as nylon, Perlon and the like, can be dyed according to a known process with certain chromium complex azo dyes which contain *no free sulfonic acid groups*. These dyeings show good fastness to light and moisture but it is reported that the results are not quite satisfactory.

It has been observed that this method leads to even more uniform dyeings when ethylene oxide polymers or condensates of ethylene oxide with higher fatty acids are added. (One of the examples mentions higher alcohols rather than fatty acids.) The dyeing process is carried out in a primarily alkaline (ammoniacal) bath, while the pH value is decreased gradually during the dyeing procedure either by evaporation of ammonia or by the slow addition of acid or acid-splitting salts.

Example: A nylon sliver is treated in a dyebath containing mixtures of azo dyes with chromium complex dissolved in the presence of ammonia, ammonium sulfate and a polyglycol-ether prepared by polycondensation of ethylene oxide. During the dyeing process the pH drops from 9.5 to 6. Well-penetrated, level dyeings are obtained.

Reference may be made to American Cyanamid's USPat 2,638,404 [cf *Am Dyestuff Reptr* 43, 67 (1954); also references cited to this digest], wherein the use of ethylene oxide condensates of high, substituted triazines as assistants in dyeing wool or nylon with chromium-complex azo dyes is advocated. The essential difference appears to be that the current method refers to dyeing with chromium-complex azo dyes free of sulfonic acid groups from alkaline to neutral baths.

STABILIZING FABRICS by Compressive Shrinkage of Selvedges G,3

Brit Pat 700,413 (Bleacher's Assoc Ltd——— Melville———Dec 2, 1953)

"Sanforizing" or similar mechanical stabilizing processes generally call for the compressive shrinking of fabrics lengthwise, ie, in the direction of the warp, followed by tension in the direction of the filling on a tenter frame. Equipment for this purpose is the subject of many patents, eg, Cluett-Peabody's British patents 359,759, 370,814 and 378,230. Another series of British patents granted to Wrighley et al refers to another type of device, which also effects shrinkproofing by a compressive treatment in the warp direction. In these processes the compressive warpwise shrinkage is effected *across the*

full width of the fabric, which is fed to the tenter frame in a uniformly shrunk condition. Devices for carrying out these methods are said to be costly and bulky.

British patent 700,413 calls for the application of compressive shrinkage *to the selvedge portions only*, the inner part of the fabric remaining substantially unshrunk. Thereafter the goods are subjected to tensioning across the whole width on a tenter frame. This arrangement is said to require smaller and less expensive equipment. As the selvedges are shrunk in the lengthwise direction, the inner areas of the fabric will shrink in the same direction by reason of the tension which is subsequently applied on the frame.

Figure 1 shows the location and Figure 2, the detailed construction, of the shrinking heads which are placed on both sides of the tenter in front of the chain. Two rollers (20 and 23) are mounted on a support (19), which is bolted to the frame (16) of the tenter. Over these two rollers passes an endless rubber belt (29), which can be compressed by roller (30) using hand wheel (33). The shrinking heads on both sides of the frame are identical. By adjusting the pressure, one can increase or decrease the amount of shrinkage applied to the selvedges. The fabric is first gripped on the selvedge portions by the shrinking heads after which it passes over a guide roller (40) to the tenter frame.

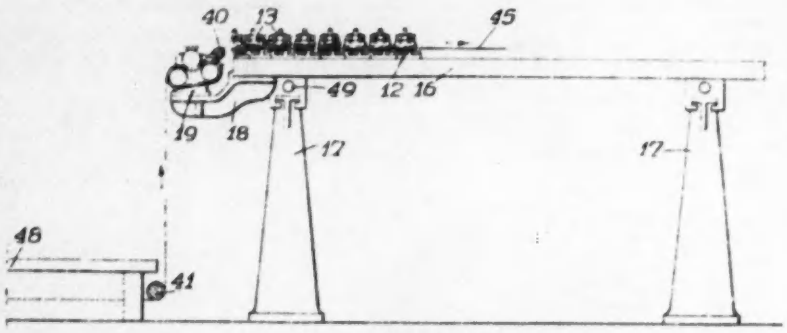


Figure 1—BP 700,413

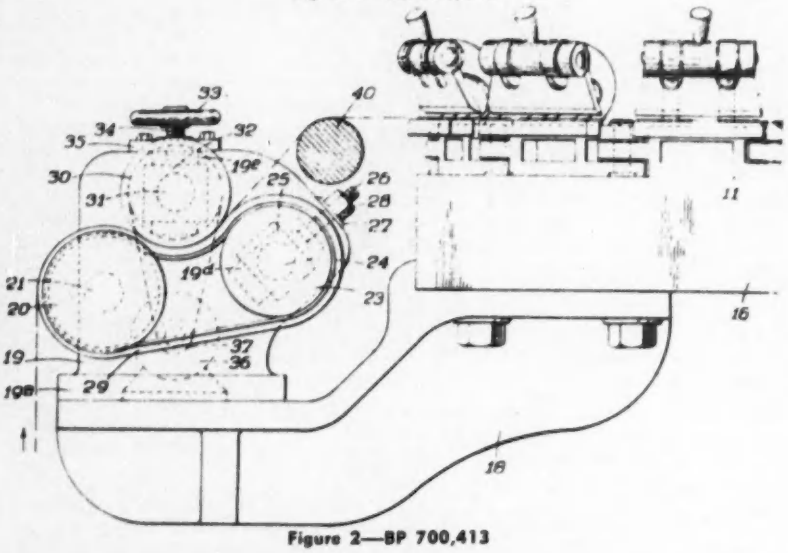


Figure 2—BP 700,413

ABSTRACTS

Readers desiring complete copies of the articles abstracted below are requested to write direct to the publication indicated. The various addresses are as follows:

British Rayon & Silk Journal———St James House, 44 Brazennose St, Manchester 2, England; Journal of the Society of Dyers & Colourists———32-34 Piccadilly, Bradford, England; Textile Age———32 W Putnam Ave, Greenwich, Conn

Industrial Applications for Synthetic Fibers

J M Swanson, *Textile Age* 18, 62-3, December, 1954.

Fibers such as nylon, viscose rayon, and protein fibers have been added to wool or fur felts in recent years, but only in small proportions to help develop specific properties or to reduce costs. Felts from 100 percent synthetic fibers cannot be made by the conventional process because they do not have the scaly surface possessed by wool and fur.

A method has now been devised by Du Pont technicians for producing felts from 100 percent Dacron fiber by a process of "fiber entanglement" and heat treatment, which is described by the author.

Dacron felts find many uses for which wool felts are unsuitable; eg, for filtering corrosive liquids; in polishing, due to their excellent abrasion resistance; and for medical applications, since they are easily cleaned and introduce no allergy problems.

Reinforced plastics produced by low-pressure molding techniques have come into the limelight in recent years and are now recognized as a new class of structural materials with great possibilities. Thus far, glass fibers have found the most general application as reinforcements. It is now believed that organic synthetic fibers also have an important place in this field. Laminates made with Dacron, Orlon, and nylon show outstanding surface properties, including smoothness, abrasion resistance, and resistance to both chemical attack and weathering.

"Teflon" tetrafluroethylene continuous filament yarn is now in an experimental state of development. At room temperature this yarn is about three-fourths as strong as nylon yarn. Its resistance to strong chemicals (eg, to aqua regia and caustic soda at high temperatures) makes it suitable for a wide range of products, such as filtration fabrics, packings, gaskets, and protective clothing. The yarn is said to process relatively easily into fabrics or braids.—WHC.

Dyeing of Materials for Plain and Face-Finished Auto Fabrics

M G Morris, *Dyestuffs* 40, 241-52, December, 1954.

Originally, the closed car was upholstered almost exclusively with pile fab-

rics. However, because of costs and other factors, pile fabrics have been quite largely displaced by all-wool or part-wool smooth fabrics, either plain or face-finished.

The term "face finish" is used because the cloth is subjected to a very severe finishing routine only on the face. Originally this was reserved for all-wool cloths, but in recent years it has been largely used on part-wool materials. In the latter case there must be a wool content of close to 70 percent, while 30 percent of substitute fibers is often made up of nylon and rayon. The severity of the finishing operation requires that only those dyes having best fastness to finishing are permissible, while the car builders permit the use of only those dyes having best fastness to light.

The author gives full details of the various face-finishing operations to which the dyed fabrics are subjected, including fulling, napping, potting, shearing, and decating. Their combined effect is to produce a material so different in texture and color from what it was in the beginning that it is hardly recognizable as the same fabric. It adds a pile, a luster, and a solid firm feel to woolen cloth that cannot presently be obtained in any other way, according to the author.

To introduce pattern work into the fabric, raw-stock dyeing is usually resorted to, but even in solid color work raw-stock dyeing is generally used because it permits the production of a large yardage of excellent uniformity.

Details are given for handling the raw wool, nylon staple, and rayon staple in their respective dyeing operations, and for blending them after they are dyed. Top-chrome dyes are used for wool; chrome, Chromolan, or milling dyes for nylon; and sulfur dyes for rayon.

Cheaper fabrics, both stock- and piece-dyed, are offered to the trade without the face-finishing feature. Stock dyes of this type are usually fulled much more lightly than face-finished cloths, and the potting operation is eliminated.

Other cheaper lines are made up by combining cotton and wool yarns in the weaving to produce figured effects, such as diamonds, squares, plaids, etc. These are piece dyed with fast-to-light union and neutral colors and finished to make the pattern stand out. These goods are fulled and scoured first, then piece dyed, sheared, pressed, and decated.

New fibers are appearing from time to time, each of which is receiving the attention of the car builders. These fibers include Acrilan, Dacron, Dynel, Orlon, Saran, Vicara, etc. So far, none of them has appeared to have what it takes to displace the current fibers and fabrics. —WHC.

Infra-Red Primer

W Lode, *Dyestuffs* 40, 253-8, December, 1954 (from *Textilber*).

The ever-increasing demand for coatings and dyeings possessing a definite (high, medium, or low) power of reflecting infra-red rays has compelled many people who have been accustomed to working only with visible light to give consideration to rays of this type. For those who find themselves in this situation this article provides a survey of the most important properties of infra-red radiation, and explains how various dyed layers behave towards such radiation and how this behavior can be used.

The author describes in much detail the nature of infra-red radiation and tells how it differs from radio waves, heat radiation, light, and x-rays.

Of particular interest is his discussion of "camouflage," or the covering of objects (ie, in wartime) to protect them from observation by visible-light or infra-red photography. If the object to be camouflaged must be completely inconspicuous in a photograph taken from an airplane, it must present exactly the same appearance as its surroundings, regardless of the type of observation to which it is subjected, whether by visible light or by infra-red. Some substances transmit the infra-red rays but absorb visible light; chlorophyll, the green coloring matter of plants, belongs in this category. If the environment of the camouflaged object consists of plants and leaves, they will appear green in visible light and white in infra-red observation. Consequently, the camouflaged object must also exhibit a green appearance in visible light and possess a high power of reflecting infra-red rays. Bare, moist earth absorbs infra-red rays and therefore appears black in infra-red observation. Consequently the camouflaged object on a freshly ploughed field must also appear dark, both visually and in infra-red radiation.

Objects to be camouflaged properly must be dyed or painted with substances having the same optical properties as the surroundings.—WHC.

Textile Finishing in Relation to the Cellulosic Man-Made Fibers

H A Thomas, *Brit Rayon & Silk J* 31, #364, 70-7; #365, 66-7; September and October, 1954.

This is a general treatise on modern rayon finishes, in which the author touches on theory, practical problems, and the evaluation of results.

He first discusses the familiar crease-resist process, and claims that the application of a resin finish to a viscose rayon fabric can give crease-resistance of the same order as that of a wool fabric. He points out, however, that the processes are not as successful on filament rayon as on spun rayon. The difficulty of crease-resisting cotton fabrics, and the attempts to overcome it, are discussed. Urea-formaldehyde is still the most widely used resin, but the use of melamine-formaldehyde involves less risk of tendering from chlorine retention, it is claimed. The reaction of the resin with the cellulose molecule, forming cross-links, is explained.

Testing the efficiency of the resin application, both for crease resistance and for the effect on the tensile strength and extensibility of the fabric, is described. The percentage of resin on the fiber may be determined by difference, after removal of the resin from the fiber by acid treatment. Colorimetric tests have also been developed, based on a) the resist effect of the resin for certain azoic dye bases, b) the mordanting effect of the resin for certain disperse dyes.

The author states that, unfortunately, the crease-resist finish is vulnerable to unscrupulous commercial practices. Inefficient crease-resist finishing can seriously debase and vitiate a fiber and fabric.

The general subject of dimensional stability of spun rayon fabrics is also discussed by the author, and several typical shrink-resist processes are described. Waterproofing by the "Velan" method is also briefly referred to.

The author admits in conclusion that in spite of the successful application of chemicals in the finishing of cellulosic textiles, there are still a number of difficulties to be overcome, and there is much scope for further original research in this field.—WHC.

The Dyeing of Cellulose Acetate with Nonionic Dyes: Rates of Diffusion and Their Relation to Dyeing Affinity

T J Majury, *J Soc Dyers Colourists* 70, 445-7, October, 1954.

Measurements of the rates of dyeing of five typical dyes on cellulose secondary acetate and triacetate were used by the author to evaluate the apparent diffusion coefficients of the dyes. The coefficients are shown to have a two-fold activation energy: one part is identifiable with the free energy of dyeing, and the other is attributable to mechanical obstruction of the diffusing dye by the body of the substrate.

The author suggests that a dye molecule penetrating cellulose acetate undergoes alternate absorption by the acetate and solution by the water, and that diffusion takes place in the aqueous phase. —WHC.

News of the Trade

• Koppers to Buy All AAP Capital Stock

Carrying on its program of expansion and diversification in the chemical field, Koppers Co, Inc has agreed to purchase all the outstanding capital stock of American Aniline Products, Inc, which is reported to be the fifth largest manufacturer of dyestuffs in the United States.

American Aniline Products, Inc has been principally owned by George L Armour, a brother of the late Bernard R Armour, who started the firm in this country in 1909 under the name Swiss Colours Company. In addition to its activities in the dyestuffs field, AAP is engaged in the manufacture, distribution and sales of chemicals, intermediates and auxiliary products which serve principally the textile trade. It also furnishes products for the petroleum, paper, leather and plastics industries.

According to Fred C Foy, Koppers president, no change in the corporate name is planned for American Aniline, which will operate as a wholly owned subsidiary. As such, it will come under the general supervision of the Chemical Division, which already has plants at Kobuta, Petrolia and Oil City, Pa, Kearny and Berkeley Heights, N J, and Port Arthur, Texas.

American Aniline has one plant, located on a 48-acre tract at Lock Haven, Pa. In addition, it has a warehouse in New York, and laboratory-warehouse facilities in Providence, R I, Charlotte, N C, Chattanooga, Tenn, Columbus, Ga, and Chicago, Ill. Sales offices also are maintained by the Company in Philadelphia, Los Angeles, and Chicago.

American Aniline also has a wholly-owned Canadian subsidiary, Dominion Anilines and Chemicals, Ltd, with offices in Toronto and Montreal.

George M Walker, vice president and general manager of the Chemical Division, said that operation of American Aniline will continue under present management.

"Acquisition of this Company, which did business amounting to about $10,000,000 last year, offers a promising diversification of market for the Chemical Division," Mr Walker continued. "It will enhance Koppers position in the textile field and offer additional possibilities for the Company in the petroleum, paper, leather and plastics industries which Koppers already serves substantially."

• AATCC Tests Used in Specifications for New Definition and Labeling Plan

To give more specific meaning to terms used for laundering and cleaning instructions, a new definition and labeling plan was introduced in New York earlier this month at a press meeting held by the six sponsoring organizations which developed the plan. Only five terms of reference to as many different degrees of serviceability are to be used, each defined by standard tests for color fading, color staining, shrinkage and bleaching. The tests used in the technical specifications of the plan are those developed by the American Association of Textile Chemists and Colourists.

The plan is being adopted initially by the Men's and Boys' Shirt, Pajama, and Sportswear Industry in cooperation with major retail interests and the service trades, according to Max Lovell, director-counsel of the National Association of Shirt, Pajama and Sportswear Manufacturers. Mr Lovell, who directed the meeting, said the plan is a voluntary one which is applicable in other apparel trades and that it is hoped the new definitions will become a universal language for laundering and cleaning instructions in all fields of merchandising.

The plan was developed by the Inter-Industry Committee on Apparel Cleaning and Serviceability consisting of the following organizations: National Association of Shirt, Pajama & Sportswear Manufacturers; National Institute of Drycleaning; American Institute of Laundering; National Retail Dry Goods Association, National Association of Retail Clothiers and Furnishers, and the Associated Men's Wear Retailers of New York. The Board of Directors of each group reportedly has approved the plan in its final form.

The first or top category of serviceability in the plan is "Completely Washable." Garments bearing this label would be those that can be laundered in hot water up to 160°F in a commercial laundry or in a home washing machine, with a soap or synthetic detergent. Such garments can also be bleached if necessary.

The second or next lower class of serviceability is "Fully Washable — Do Not Bleach." Garments so labeled would be those that can be laundered with the same freedom as "Completely Washable" except that they should not be bleached.

The third, fourth and fifth labels, which cover lesser degrees of serviceability because of certain color and shrinkage limitations, are as follows: "Wash in Warm Water — Do Not Bleach (up to 120 degrees F)"; "Wash by Hand in Lukewarm Water — Do Not Bleach (105 degrees F maximum)"; and "Dryclean." The latter simply means that garments so labeled should be drycleaned for best results.

Mr Lovell explained that the plan does not call for any distinctive form of label or copyright designation. It is felt, he said, that the sheer force of industry recognition of these terms and their definitions will bring about its universal acceptance. Furthermore, as consumer awareness of these terms and their meaning become general, the plan will become more firmly entrenched in trade practice.

Mr Lovell further stated that this is the first time that an effort has been made by industry to specifically define the meaning of serviceability terms used for laundering and cleaning instructions. He said the project was undertaken nearly two years ago in recognition of the need for instructional language which would have more specific meaning to consumers, laundries and cleaners, as well as relate more closely to the actual serviceability of fabrics.

He pointed out that the plan does not duplicate efforts currently being made to establish minimum performance requirements for textiles covering all essential color and fabric behavior characteristics. He said the plan is concerned solely with defining laundering and cleaning terms on the basis of tests, but added that the plan can, however, be adopted to such standards insofar as laundering and cleaning instructions are concerned.

Mr Lovell went on to highlight the value of the plan in calling particular attention to its advantages to consumers, launderers and cleaners as, under the plan, garments are clearly labeled as to just how they should be handled. Where special instructions are required in addition to the label, such instructions must also be a part of the label, and may be amplified in the hang tag information. These include "Iron on Wrong Side," "Wash Separately," etc. In addition, where the qualification "Do Not Bleach" applies, it must be stated in immediate conjunction with and in type of equal size and prominence with the accompanying descriptive term. This also applies to any advertising in which this wording of the labels is used.

The technical subcommittee established by the Inter-Industry group to develop the plan consisted of the following in addition to Mr Lovell as chairman:

(*Representing Manufacturers*)———Hal Bellinson, Cluett-Peabody & Co; Jack Craig, Wilson Brothers; Robert McCreery, Phillips-Jones Corp. (*Representing Retailers*) ——— Charles W Dorn, J C Penney Co, Inc; Dr Jules Labarthe, Mellon Institute of Industrial Research; Robert Stutz, Better Fabrics Testing Bureau. (*Representing Service Industries*)———Louis Haviland, American Institute of Laundering; Ralph B Smith, New Jersey Laundry & Cleaning Institute; Albert E Johnson, National Institute of Drycleaning, Inc.

The technical specifications of the plan, including references to test procedures and requirements, are available at the offices of the National Association of Shirt, Pajama & Sportswear Manufacturers, 276 Fifth Avenue, New York, N Y.

• Zinsser Acquired by Harshaw Chemical

Zinsser & Co, Inc, established in 1897 by F G Zinsser, was acquired last month by The Harshaw Chemical Co, Cleveland, O. It will continue to operate at Hastings-on-Hudson, N Y under present policies and management as a wholly owned subsidiary of the Cleveland concern. Under the new arrangement, considerable expansion is planned in the organic chemical field.

Zinsser & Company, Inc, started as a producer of logwood blacks and expanded into the tannic acid and pyrogallic acid fields. These were the Company's chief products until World War I. During World War I, Zinsser served the U S Government by producing mustard gas. Immediately thereafter the Company undertook a research program on the manufacture of dyestuffs, using its own raw materials, and from these were produced such colors as alizarine browns, blues, greens, etc. In addition the Company developed several photographic chemicals, eg, hydroquinone, metol, chlor hydroquinone, etc.

In 1926 Zinsser absorbed the Ultro Chemical Company, producers of high-grade orange pigments. Shortly afterwards the combined research efforts of both companies led to the development of the Quinizarine dyestuffs for the woolen and synthetic textile fields.

During World War II, Zinsser again turned its efforts to producing materials for the Government. The Company became a prime contractor on several important smoke colors, while also producing photographic chemicals and dyestuffs for the armed forces.

New officers of Zinsser & Co, Inc are as follows: R H Giebel, chairman of the board; J L Berston, president; C S Parke, vice president; H W Dingee, vice president & sales manager; R J Perry, vice president & secretary; A D Perry, treasurer; M D Griffith and R A Neely, assistant treasurers; H C Homberg, controller; W H Brown, assistant secretary; Georgianna E Faith, cashier.

The following are the directors of Zinsser & Co, Inc: J L Berston, president, Zinsser & Co, Inc; H W Dingee, vice president, Zinsser & Co, Inc; R H Giebel, vice president; The Harshaw Chemical Co; W J Harshaw, president, The Harshaw Chemical Co; H C Hovey, vice president, The Harshaw Chemical Co; C S Parke, executive vice president, The Harshaw Chemical Co; A D Perry, treasurer, The Harshaw Chemical Co.

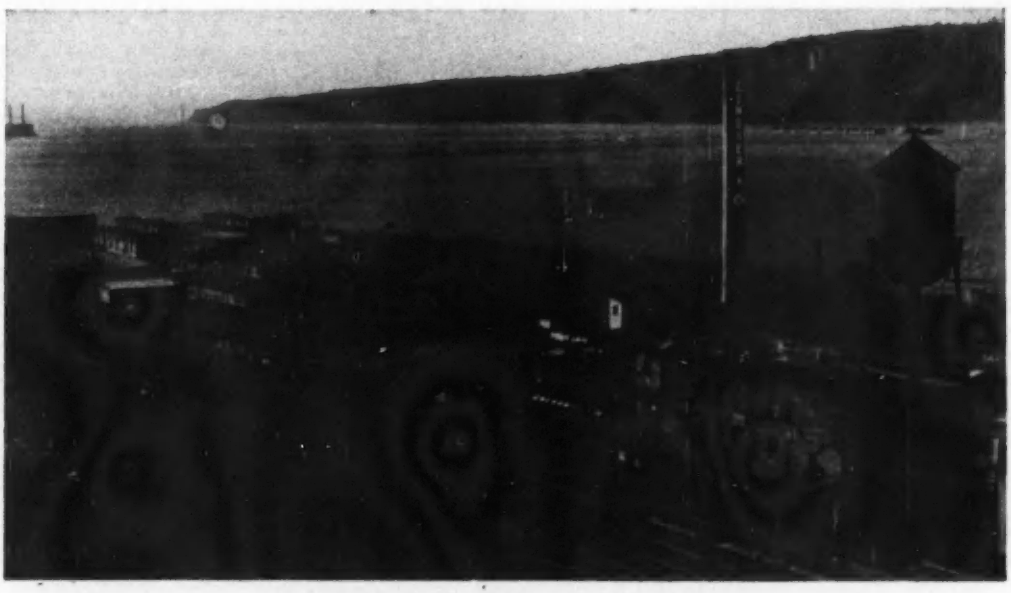
• Seydel-Woolley Expansion Continues

Seydel-Wooley & Co, a leading manufacturer of textile chemicals, is now carrying out its sixth major expansion program since returning to Atlanta, Ga, in 1923.

The firm, which markets its warp-sizing and wet-processing auxiliaries under the Seyco trademark, was founded by Paul and Herman Seydel in the Georgian city in 1904 as the Atlanta Compound Company. A few years later, the company was moved to Jersey City, N J, where it flourished as the Seydel Chemical Co. Growth was rapid, with the firm branching into several other lines, including pharmaceuticals and intermediates. In 1923, Paul Seydel returned to Atlanta as president of the new firm of Seydel-Woolley & Co. Vassar Woolley, who had formerly been general superintendent, was made sales manager. After the death of Mr Seydel, Mr Woolley became president, and Mr Seydel's sons, Paul, Jr, and John, became vice presidents. Today the firm is generally acknowledged to be among the nation's largest producers of warp-sizing compounds.

Present expansion is in the storage and manufacturing facilities, particularly those of the recently formed Finishing Chemicals Division, which produces surfactants, softeners, and other wet-processing auxiliaries. The growth of this Division has already made inadequate the building which was constructed to house it three years ago.

Plans are also being drawn for the expansion of laboratory facilities to keep pace with the company's accelerating research program and development work.



Hastings-on-Hudson, N Y, plant of Zinsser & Co, Inc

Sheraton Hall, in Montreal's Sheraton-Mount Royal Hotel, was transformed into an impressive display of products of the Canadian textile industry during the "Panorama of Canadian Fabric and Fashion", April 20-23. Twice-daily showings of couturier-designed gowns featured the show.

F D Wallace (left) receives the first Bronze Medal Award for outstanding service to the Quebec Section, Canadian Association of Textile Colourists and Chemists, from L J Sheps, Quebec Section president.

• Canadian Textile Panorama

A panorama of textile fabric and fashion dramatically portrayed Canadian design and manufacturing achievements in textiles at Montreal's Sheraton-Mount Royal Hotel last month.

Under the sponsorship of the Quebec Section, Canadian Association of Textile Colourists and Chemists, the three-day exhibition drew impressive crowds. The more than 100 companies which devoted time and money to the success of the Panorama included dyestuff and chemical manufacturers as well as producers of fibers, fabrics and garments.

Special emphasis throughout the Panorama was placed on the important role that chemistry plays in the production of fine fabrics. At each performance, a model would emerge from a five-foot caldron which was placed on the center of the large stage at the head of an artistically decorated runway. A large mural decoration of familiar chemical symbols, live steam, motor noise, etc, created the illusion of actual dyehouse operation. This introduction set the stage for an elaborate fashion show, which was presented daily.

The exhibition, held in conjunction with the 19th annual meeting of the Quebec Section, was open to the public.

"The interest shown in this initial effort by an inexperienced group of technical men to arrange for, manage and produce a fashion show was," according to Leon F Moody, general chairman, "a difficult problem, but the results were most rewarding as the total attendance was reported to have been in excess of twelve thousand."

The decision of the committee not to sell booth spaces, but rather to solicit the support of voluntary contributions to support the "Panorama" evoked so much favorable comment that the plan will, it is understood, be continued in future annual meetings.

Recognition of the companies who cooperated by devoting time and money to the success of the Panorama was made by listing their names on large signs.

In the section devoted to Dye and Chemical Control Testing, the names of the following manufacturers and dealers were listed as exhibitors and sponsors:

Althouse Chemical Co, Inc
H L Blachford, Ltd
Canada Colors & Chemicals (Dominion) Ltd
Canadian Aniline & Extract Co Ltd
Canadian Industries (1954) Ltd
Carbic Color & Chemical Co, Inc
Chemtex Products Ltd
Ciba Co Ltd
Clough Chemical Co Ltd
Clough Dyestuff Co Ltd
Commonwealth Color & Chemical (Canada) Ltd
Consolidated Dyestuffs & Chemicals Ltd
Dominion Anilines & Chemicals Ltd
Dow Corning Silicones Ltd
E F Drew & Co, Ltd
Du Pont Co of Canada Ltd
Dye & Chemical Co of Canada Ltd
Geigy Dyestuffs, Division of Geigy Chemical Corp
Harmont Color & Chemicals Ltd
Hart Products Co of Canada Ltd
L B Holliday & Co of Canada Ltd
Irwin Dyestuff Corp Ltd, Division of Canadian Developments of Canada Ltd
Marwin Dyestuff of Canada Ltd
Metro-Atlantic Canada Ltd
National Aniline & Chemical Company Ltd
Nopco Chemical of Canada Ltd
North American Cyanamid Ltd
Nova Chemical Corp
Progressive Color & Chemical Co Ltd
Quaker City Chemical Co of Canada, Ltd
Reliable Chemical Products Co
Rohm & Haas Co of Canada, Ltd
Thomas Rostron & Co
Sandoz (Canada) Ltd
Scholler Bros Ltd
Shawinigan Chemicals, Ltd
Charles Albert Smith Ltd
Texall Products Co Ltd
Texavon Chemical Co Ltd
The Ault & Wiborg Co of Canada Ltd
The Canadye Corp
The McArthur Chemical Co Ltd
Trilon Chemicals Ltd
Woonsocket Color & Chemical Co
Yocum Faust, Ltd

In the Fabric Section, bolts of the various materials were shown collectively, the only identification being small cards, which in the instance of the synthetics listed only the yarn trade-name.

Among the highlights of the Annual Meeting itself was the presentation of the Section's first Bronze Medal Award "as recognition of exceptional service to the Association." The initial winner of the Award, which will be made annually or less frequently in the future, was Frederic Donald Wallace, CATCC's 8th president. In presenting the award to the medalist, L J Sheps, chairman of the Quebec Section, paid special tribute to Mr Wallace's work in the Section's educational program.

Guest speaker at the annual meeting was E F King, vice president — sales, Dominion Textile Company Ltd, who discussed "Promotional Advertising."

James J Clough, Clough Chemical Co, Ltd, served as master of ceremonies at the annual dinner, which was followed by a floor show.

• Chemical and Allied Buyers Group to Meet

The Chemical and Allied Products Buyers' Group of the National Association of Purchasing Agents will meet at the Waldorf Astoria in New York from May 29th through June 1st.

Their program will include five panel discussions, the annual business meeting, and the election of officers.

• KAE Attendance Exceeds 9000

The 42nd Knitting Arts Exhibition, held last month at Atlantic City's Convention Hall, attracted more than 9000 visitors, according to estimates of show officials.

A notable increase in the amount of machinery on exhibit was thought to be one of the contributing factors in luring a near-record turnout, in spite of week-long inclement weather.

Several sources have expressed the opinion that more orders were written at this year's KAE than in any previous one.

• Pulp Chemicals Association Organized

The growing importance of chemicals derived from the black liquor skimmings and other by-products of the southern kraft pulp manufacturing industry was recognized recently at the Annual Meeting of the Tall Oil Association. At that meeting the Association was completely reorganized. A new parent Association, the Pulp Chemicals Association was formed with Albert Scharwachter, vice president of Arizona Chemical Company, as its president and Leonard J Doyle, vice president of Union Bag & Paper Corporation, as its vice president. The former Tall Oil Association became the Tall Oil Division of Pulp Chemicals Association with Albert Scharwachter as its chairman and A E Griffin of Camp Manufacturing as its vice chairman.

A new Sulphate Turpentine Division was formed to handle the problems of that important naval store, and a third division, the (Tall Oil) Fatty Acids Division, was also formed.

The new Association is so organized that additional divisions may readily be formed to handle the problems of any other chemicals.

The new Association's headquarters will be at 122 East 42nd Street, New York, N Y, the same address as that of the former Tall Oil Association. Dernell Every will act as secretary, T K Heston as assistant secretary and I B Oseas as counsel.

• CCNE Annual Dinner Attracts 400

Approximately 400 members and guests attended the 9th Annual Dinner of The Chemical Club of New England, Inc, which was held at the Louis XIV Ballroom of the Somerset Hotel in Boston on March 24th.

Arrangements for the function were handled by John E Upham, Jr, Hercules Powder Co. He was assisted by William B Sinclair, Celanese Corp of America, and Thomas J Desmond, E I du Pont de Nemours & Co, Inc.

• Taylor Occupies New West Coast Plant

Taylor Instrument Companies on May 1st moved its San Francisco offices and plant across San Francisco Bay to 1661 Timothy Drive, San Leandro, Calif. Decision to relocate the plant and sales offices was made on the basis of a greatly increased volume of sales and service activities in the San Francisco area.

The new plant reportedly has much better facilities and equipment than those previously available in the San Francisco area. It is said to be capable of duplicating many manufacturing and repair techniques followed in the company's main plant in Rochester, N Y. Set up to make repairs and assemble new instruments, it contains 16,800 square feet of floor space, has extensive parking facilities, and is centrally located.

• MIT Offering Course in Parachute Technology

To survey current progress in the theory and application of parachute materials and designs, the Massachusetts Institute of Technology will offer during the 1955 Summer Session a two-week special summer program on "Parachute Technology" from Monday, June 20, through Friday, July 1.

Further information and application blanks may be obtained from the Office of the Summer Session, Room 7-103, MIT, Cambridge 38, Mass.

Mr and Mrs Henry Rutherford are shown boarding an Eastern Airlines plane for the first leg of a trip to South America. About twenty-five textile people and friends were on hand for the send-off from Raleigh, N C, airport.

Mr Rutherford, head of the Department of Textile Chemistry and Dyeing at North Carolina State College, is in Lima, Peru helping to organize a textile school at their National College of Engineering.

NEW PRODUCTS AND DEVELOPMENTS

• Identa-Lite Shows Up Potential Dye Streaks in Raw Cotton or Grey Goods

The Identa-Lite, a product of Charlotte Chemical Laboratories, Inc, Charlotte, N C, utilizes three 48" ultra-violet ray lamps and a special high intensity reflector to aid in the elimination of potential dye streaks at the source.

Under its rays each of the potential dye-inhibiting types of fiber, such as immature, cat-eye, or "California" cotton, has a characteristic reaction. The same is true of oil spots or other contamination in grey cloth or hosiery. Thus the Indenta-Lite should be of interest to the textile processor as a tool for pin pointing the causes of improper dye absorption in cloth and hosiery.

The complete unit sells for $75.00 fob Charlotte.

• Aula Develops New Pad Dye Process

A new process for obtaining complete uniformity of shade when padding light to dark colors has been announced by Aula Chemicals, Inc, Elizabeth, N J, manufacturer of water-dilutable pigment colors.

Aulabrite Pad Dye Process No. 18, as the new system is called, is said to produce extremely low crock and excellent fastness to light, washing and drycleaning. It was designed for the application of Aulabrite 3000 Series colors, for the dyeing of cotton, rayon, acetate, Orlon, nylon, Dacron, and other natural and synthetic fibres.

• Calcofluor White RWS

A new water-soluble whitener, Calcofluor White RWS, similar in shade and brightness to Calcofluor White RW, has been added to American Cyanamid Company's line of brighteners.

Calcofluor White RWS has been developed especially to facilitate application procedures of brighteners to wool, nylon, acetate, pure silk and Orlon textiles, according to the Company.

The producer states that water-soluble Calcofluor White RWS may be applied by the usual dyeing or padding methods. This is done as a separate treatment during wet processing or in combination treatment during chemical washing, rinsing and bleaching; discharge printing, pastel dyeing; and application of finishing agents.

NAMES IN THE NEWS

Valko

Tesoro

Molteni

Onyx Oil & Chemical Company, Jersey City, N J, has announced the election of EMERY I VALKO as vice president of the company. Dr Valko continues as director of research, a position to which he was appointed upon rejoining Onyx in 1954. He is also serving as collaborator of the Cotton Fiber Section, Southern Utilization Research Branch, U S Dept of Agriculture.

Also announced by Onyx was the appointment of GUILIANA C TESORO, former head of the Organic Research Department, as assistant director of research in charge of chemical research for the company. Dr Tesoro has been with Onyx since 1944.

A third appointment is that of HENRY A MOLTENI as assistant director of research in charge of development and services. Mr Molteni was formerly with E F Drew & Co and Corn Products Refining Co.

Appointment of STANLEY I CLARK, Sterling Drug Inc, as chairman of the Nominating Committee of the Drug, Chemical and Allied Trades Section of the New York Board of Trade, has been announced by CLAUDE A HANFORD, Pharmaco Inc, Section chairman.

Other members appointed were HAROLD C GREEN, Strong Cobb & Company, Inc, CHARLES M MACAULEY, Charles M Macauley Associates, LLOYD I VOLCKENING, Ivers-Lee Company, and C P WALKER, JR, van Ameringen-Haebler, Inc.

The Committee will prepare a slate for the Executive Committee which will be elected at the Section's Annual Meeting at Pocono Manor September 22-24.

The members of the Chemical Club of New England, Inc, at their annual meeting last month in Boston, elected MORTON S JOHNSON as their president. Mr Johnson, New England Branch manager for Solvay Process Division, Allied Chemical & Dye Corp, has been associated with the chemical industry for 29 years.

Other Club officers elected were: GEORGE W SMITH, E I du Pont de Nemours & Co, Inc, vice president; JOHN E UPHAM, JR, Hercules Powder Co, treasurer; IRVING G LOXLEY, Heyden Chemical Corp, secretary; and EDGAR J POTVIN, Worcester Chemical Distributors Corp, director (for 3 years).

JOHN H ELLEMAN has been named director of the newly established Coordination Department, Solvay Process Division, Allied Chemical & Dye Corporation, and ARTHUR PHILLIPS, JR succeeds Mr Elleman as director of sales.

Under the new set up, Solvay's Technical Service Department will report to Mr Elleman, who will make his headquarters at Syracuse, N Y. In addition, he will supervise Solvay's sales training program and maintain liaison between the sales, operating and development departments. Mr Phillips will continue at Solvay's executive office in New York.

J EDWARD LYNN has established a consulting service, specializing in colloid chemical and related engineering problems, with headquarters in Connecticut at P O Box 734, Old Greenwich.

Dr Lynn for the past two years has served as director of basic research at National Gypsum Co. Prior to that he had spent twelve years at American Cyanamid Company's Stamford Research Laboratories in charge of developing textile chemicals, textile resin finishes, and surface-active agents.

Consultation in emulsification, emulsion breaking, controlled precipitation, dispersion, rheology, system and viscosity stabilizing, detergency, etc, will comprise the bulk of the service.

VICTOR E STILWELL, formerly assistant plant engineer, has been appointed assistant chief chemical engineer of the Bound Brook, N J Plant, Organic Chemicals Division, American Cyanamid Company.

Appointment of MATTHEW J QUIGLEY as New England District manager of Interchemical Corporation's Textile Colors Division, Hawthorne, N J, has been announced by WILLIAM J ROTHEMICH, Divisional president.

Mr Quigley joined Interchemical Corporation in 1940 and has been with that organization continuously with the exception of one year's military service. In 1948 he was made technical representative for the New England District of the Textile Colors Division, with headquarters at 11 Winthrop Ave, Pawtucket, R I.

PHILLIP H DEWEY has been appointed to the newly created position of administrative assistant at the central Research Laboratories of Interchemical Corporation in New York.

In this capacity, Mr Dewey will work on the business administration portion of the company's research effort. He continues as editor-in-chief of the *Interchemical Review*, technical publication of the Corporation.

Chicopee Manufacturing Corp, New Brunswick, N J, has announced the appointment of J K SUMNER as manager of technical service of its Non-Woven Fabrics Division.

Dr Sumner joined Chicopee in 1946 as assistant technical director of the Non-Woven Fabrics Research Laboratory at Milltown, N J. He will continue to make his headquarters at Milltown.

Additional promotions in the Research Laboratory at Milltown include E J YEDLICK, who has been elevated from senior chemist to group leader in charge of technical service; and J J OSMAR, who has also been promoted from senior chemist to group leader in charge of infant specialty and binder research.

Quigley

Dewey

Sumner

calco

Dyelines

AMERICAN Cyanamid COMPANY DYESTUFF DEPARTMENT BOUND BROOK, NEW JERSEY

NEW YORK • CHICAGO • BOSTON • PHILADELPHIA • CHARLOTTE • PROVIDENCE • LOS ANGELES • ATLANTA • PORTLAND, OREGON

Rich, Full-Bodied Reds

On Rayon, Cotton, Unions

Calcodur* Red 8BL is a great favorite in dye houses for producing rich, full red shades under a variety of dyeing conditions. Its excellent leveling properties permit dyeing of rayon and cotton in raw stock, skein, packages, pieces. On blends of rayon or cotton with wool, solid shades are achieved by manipulation of temperatures. On pure silk, this dye yields rich red shades with good fastness properties. Works well on linen and new synthetics.

Calcodur* Red 8BL is important as a self-shade in dyeing dress goods, linings, carpets, hand-knitting yarns, shirtings, hosiery. Full details and samples on request.

Formulate Your Blacks

Using Calcocid* Blue Black Ex. Conc. as the Base

As a self-shade for bluish-blacks—as a base for jet blacks or dark navies—this wool dye has no equal in money value. Noted for excellent color body and consistently high quality, Calcocid Blue Black Ex. Conc. is widely used for dyeing sweater yarns, ladies' dress goods, over-coating fabrics, hosiery, carpet wools. Rich shade, bloomy overtone, and excellent fastness to light.

Good solubility—highly suitable for screen printing of wool and silk fabrics. Works well in dyeing skeins, packages, pieces, top-slubbing, rawstock. Most famous as "workhorse" black for wools, gives excellent results on pure silk, unions, nylon, new synthetics.

Calcomine Blue DR solves problem of resin aftertreatment

THE PROBLEM: To produce good economical blues and navies on cellulosic fabrics which are to be given crease-proof resin treatments.

A SOLUTION: We have developed Calcomine Blue DR expressly for this purpose. When used alone, or in combination with other colors in our line of Calcodur Resin Fast Dyes, Calcomine Blue DR is well suited for dyeings involving resin aftertreatment with Aerotex Cream 450, Aerotex Resin M-3, or a combination of Aerotex Cream 450 and a copper complex.

	Wash Fastness No. 3		
	Aerotex Cream 450	Resin M-3 Aerotex	Aerotex Cream 450 and a Copper Complex
Cotton	4–5W	3–4W	4R
Viscose	5	3–4W	4R

QUICK TIPS

In An Azoic Developing Bath—excess developer over the theoretical required varies with liquor ratio. While 10% excess may be sufficient in a liquor ratio of 2 to 1, as much as 3 times the theoretical may be necessary in a liquor ratio of 35 or 40 to 1.

Cleaning Padders: Motors being splashed with water from hose pipes? Then install a perforated pipe above the top pad roll. Tie this pipe into the feed tank, and hot water or chemical cleansing agents can be run down over the pads after a run is completed.

Continuous Dyeing of Azoic Shades: Blues and certain other shades do not attain their tone shade during brief soaping on a continuous range. A suitable non-ionic detergent with ½ to 1 oz. of caustic soda is more effective than an anionic detergent with soda ash.

Calcoloid Brown RRWP Paste

Produces Uniform Results Under All Mill Ageing Conditions

Improved ageing properties... low viscosity... non-settling and non-drying or flaking in the drum... good fastness and working properties—these qualities best describe Calcoloid Brown RRWP Paste for printing.

This red shade of brown produces prints of notable fastness, economically. A range of fast printing browns can be produced by shading with Calcosol Jade Green N Supra Paste or Calcosol Golden Yellow GKWP Paste.

The following table shows the excellent fastness ratings of this brown printing paste:

FASTNESS PROPERTIES

Light	6
Wash (Cotton Wash Test No. 4)	5
Dry Cleaning	4
Chlorine No. 4	5
Water Spotting	5
Acid Spotting	5
Alkali Spotting	5

This dye is indicated especially for dress goods! Your American Cyanamid Dyestuff representative will be glad to supply you samples and detailed technical information.

$88,649 was paid in suggestion awards during 1954 to 5,690 employees by American Cyanamid Company.

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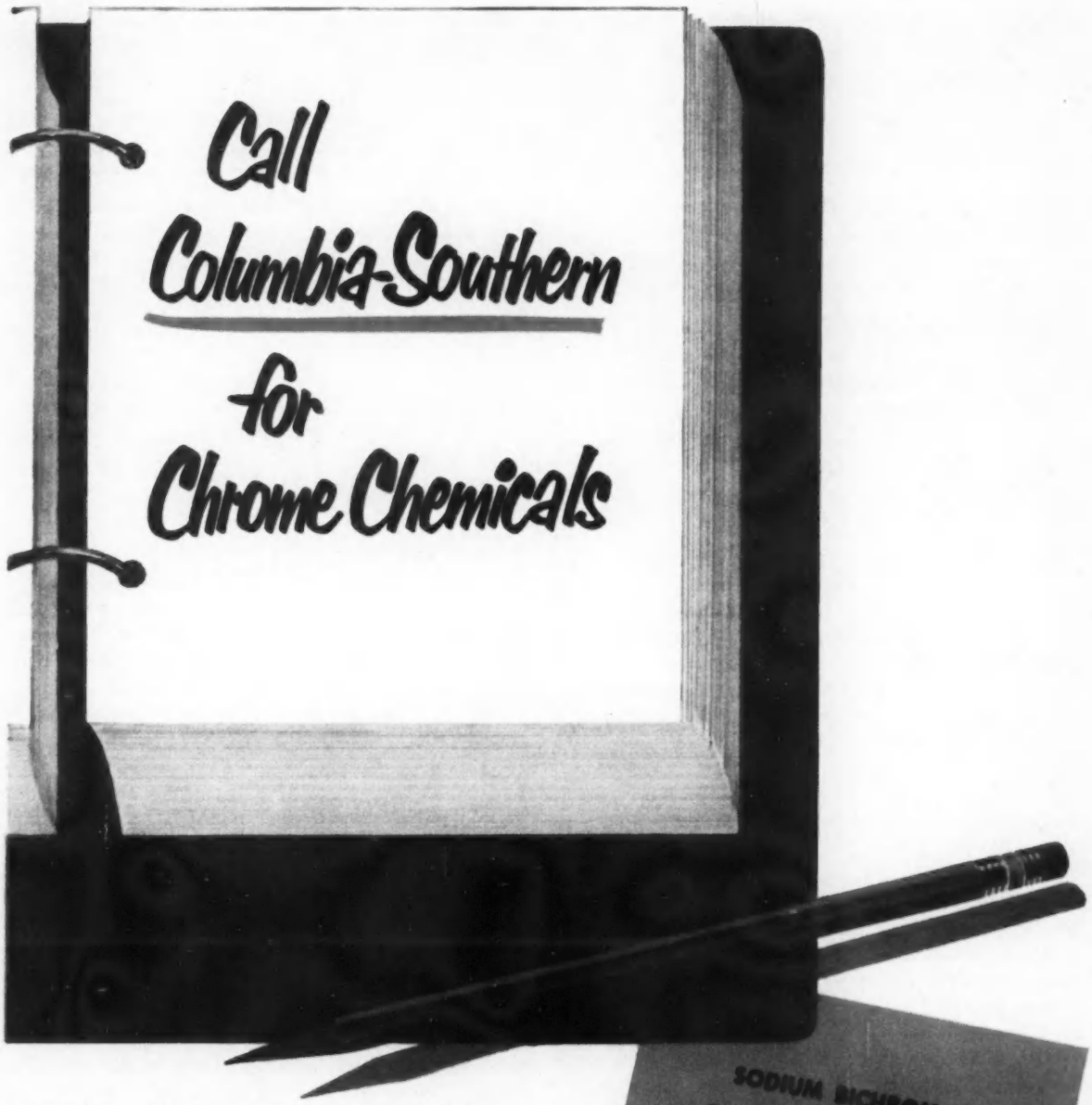

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Call today. Columbia-Southern welcomes your inquiries and the opportunity to serve you.

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ABSTRACTING SERVICE—Abstracting and digesting of foreign patents and periodicals. Literature review and special reports in dyestuff and cellulose chemistry. PAUL WENGRAF, 88-36 ELMHURST AVENUE. ELMHURST 73, NEW YORK.

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POSITION WANTED: JIG DYER, 25 years' experience, directs, acetates, nylon and blends. South preferred. Write Box No. 884.

POSITION WANTED: Textile Chemist and Colorist for technical service. Extensive experience in all branches of textile processing. Thoroughly familiar with the detailed application of dyes, pigments, chemicals and finishes. Write Box No. 875.

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POSITION WANTED: Assistant Dyer-Laboratory Technician-Colorist. Technical background; supervisory experience; under 30. Interested in position which will enable fuller use of capabilities. Must be New York or New Jersey area. Write Box No. 898.

SALES REPRESENTATIVE: Century old national manufacturer has unusual opening for technical salesman. Industrial sales experience to greige mills and/or synthetic mills required. Eagerness and ability to sell essential. Technical knowledge of textile field useful. Travel required in North Carolina and South Carolina. Our employees have been informed of this advertisement. Write Box No. 899.

PLANT CHEMIST OR DYER'S POSITION WANTED: By chemist, college graduate. Over 20 years' experience in dyeing and finishing of cotton synthetics and wool fabrics. Have worked as dyer, finisher, laboratory director and superintendent. Will consider offer anywhere. Write Box No. 900.

POSITION WANTED: Machine and screen printing. 24 years' experience. Experienced all classes of dyestuff on cotton, wool and synthetics. Fully capable of taking charge of print or color-shop department, supervisor or superintendent. College graduate. Will consider offer abroad. Write Box No. 901.

WANTED: Dyer, for upholstery and automotive piece goods on both synthetics and blends. Pile and flat fabric constructions. Location in the South. Give qualifications and references in detail. Our personnel have been informed of this advertisement. Write Box No. 902.

WANTED: TEXTILE CHEMIST. Top dyestuff manufacturer desires man to supervise established laboratory in Southern area branch. Should be familiar with lab techniques, customer service requirements; preferably experienced in demonstrating dyestuff application techniques. Write Box No. 907.

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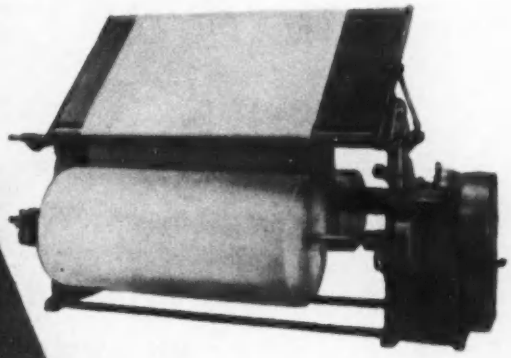

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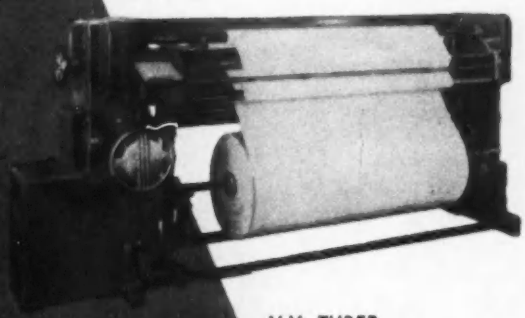

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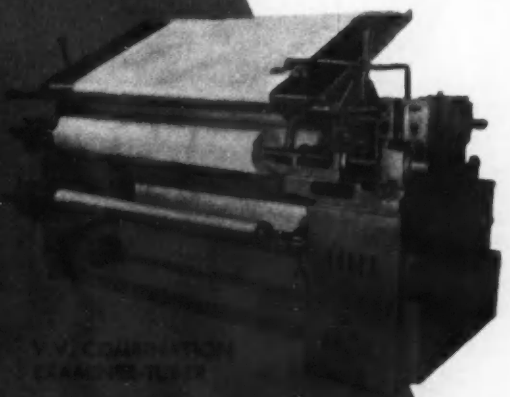

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